Electronic Supplementary Information

Density, viscosity and electrical conductivity of protic alkanolammonium ionic liquids

1) 1-Hydroxyethylammonium formate: [HEA]Fmt

Table S1 Densities *ρ* of the ionic liquid 1-hydroxyethylammonium formate at elevated temperatures *T*

Compound	1-Hydroxyethylammonium formate
CASRN	53226-35-0
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	$\pm$ 0.02 K
Water mass fraction *w* of sample before measurement	$43 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$82 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Bicak *J. Mol. Liq.* 2005, *116*, 15-18. b) Cota et al. *J. Phys. Chem. B* 2007, *111,* 12468-12477. c) Greaves et al. *J. Phys. Chem B.* 2006, *110,* 22479-22487. d) Greaves et al. *J. Phys. Chem. B* 2010, *114,* 10022-10031. e) Yuan et al. *J. Chem. Eng. Data* 2007, *52,* 596-599.
Comments on literature data	a) Atmosphere not specified, water content not specified, instrument not specified, temperature not specified. b) Atmosphere not specified, water content not specified, Anton-Paar DAS 5000 vibrational tube, calibrated with Millipore water. c) Atmosphere not specified, water content after measurement not specified, specific gravity bottle. d) Atmosphere not specified, water content after measurement not specified, instrument not specified. e) Water content after measurement not specified, pycnometer.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$2.2 \cdot 10^{-4}$

Table S1 continued…

T	ρ	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	$\rho \cdot 10^{-2}$	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
278.15	1152.0	1152.4	0.0	1322.5	-170.4	n.a.	n.a.
288.15	1146.0	1146.1	0.0	1322.5	-176.5	n.a.	n.a.
298.15	1139.9	1139.9	0.0	1322.5	-182.6	n.a.	n.a.
308.15	1133.9	1133.6	0.0	1322.5	-188.7	n.a.	n.a.
318.15	1127.9	1127.3	0.0	1322.5	-194.9	n.a.	n.a.
328.15	1121.6	1121.0	0.0	1322.5	-201.0	n.a.	n.a.
338.15	1115.1	1114.8	0.0	1322.5	-207.1	n.a.	n.a.
348.15	1107.5	1109.3	-0.2	1322.5	-213.2	n.a.	n.a.

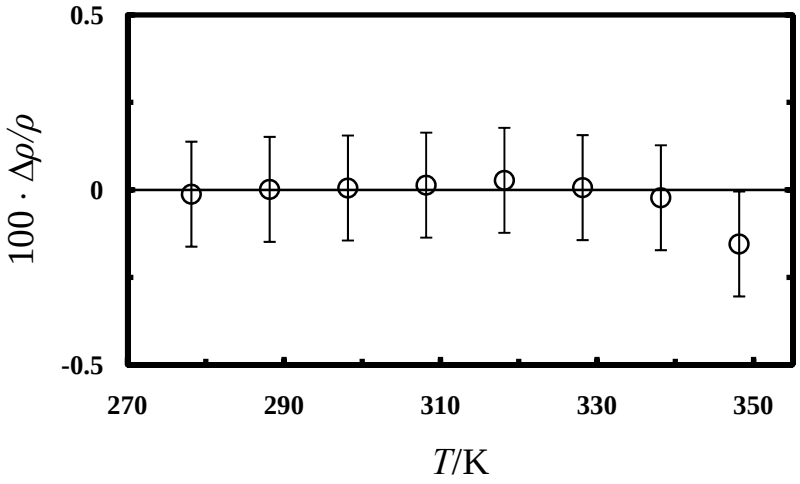

Figure S1.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid 1-hydroxyethylammonium formate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 2.2\cdot10^{-2}$. The experimental value at 348.15 K was excluded for the determination of the fit equation, because this temperature exceeds the thermal stability of this ionic liquid.

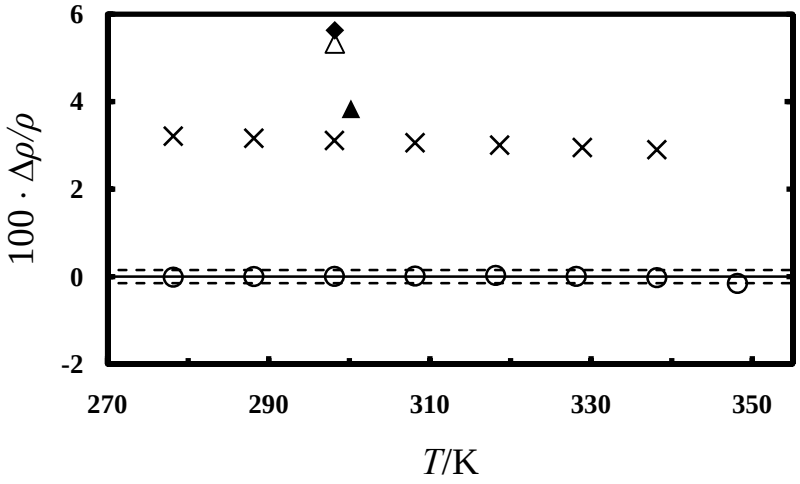

Figure S1.2 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid 1-hydroxyethylammonium formate as a function of temperature T. The dashed lines at $100\cdot\Delta\rho/\rho = \pm 0.15$ represent the expanded uncertainty of the measurements. o this work; ▲ Greaves et al.; ∆ Bicak et al.; ▲ Yuan et al.; × Cota et al.

Table S2 Viscosities η of the ionic liquid 1-hydroxyethylammonium formate at elevated temperatures *T*

Compound	1-Hydroxyethylammonium formate
CASRN	53226-35-0
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$43 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$82 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Bicak *J. Mol. Liq.* 2005, *116*, 15-18. b) Greaves et al. *J. Phys. Chem B.* 2006, *110,* 22479-22487. c) Greaves et al. *J. Phys. Chem. B* 2010, *114,* 10022-10031. d) Yuan et al. *J. Chem. Eng. Data* 2007, *52,* 596-599.
Comments on literature data	a) Atmosphere not specified, water content not specified, Canon-Fenske viscometer. b) Atmosphere not specified, water content after measurement not specified, Carri-Med CSL2 100 rheometer. c) Atmosphere not specified, water content after measurement not specified, instrument and temperature not specified. d) Water content after measurement not specified, NDJ-1 rotary viscometer.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i \quad$ where $\quad \eta^0 = 1\ \mathrm{Pa{\cdot}s^{-1}}$
Standard deviation of fit function	$9.7 \cdot 10^{-3}$

T	η	η_{eval}	$(\eta-\eta_{eval})$	A_0	A_1	A_2	A_3
K	mPa·s^{-1}	mPa·s^{-1}	$\eta \cdot 10^{-2}$	Pa·s^{-1}	Pa·s^{-1}	Pa·s^{-1}	Pa·s^{-1}
278.15	423	421	0.5	-159.6	583.9	-685.5	274.1
288.15	144	144	-0.4	-159.6	563.7	-638.7	246.5
298.15	66.2	67.6	-2.1	-159.6	544.8	-596.6	222.6
308.15	39.7	38.8	2.3	-159.6	527.1	-558.5	201.6
318.15	25.7	25.4	1.4	-159.6	510.5	-524.0	183.2
328.15	17.7	17.9	-1.0	-159.6	495.0	-492.5	166.9
338.15	12.8	13.1	-2.1	-159.6	480.3	-463.8	152.6
348.15	9.75	9.62	1.3	-159.6	466.5	-437.6	139.8

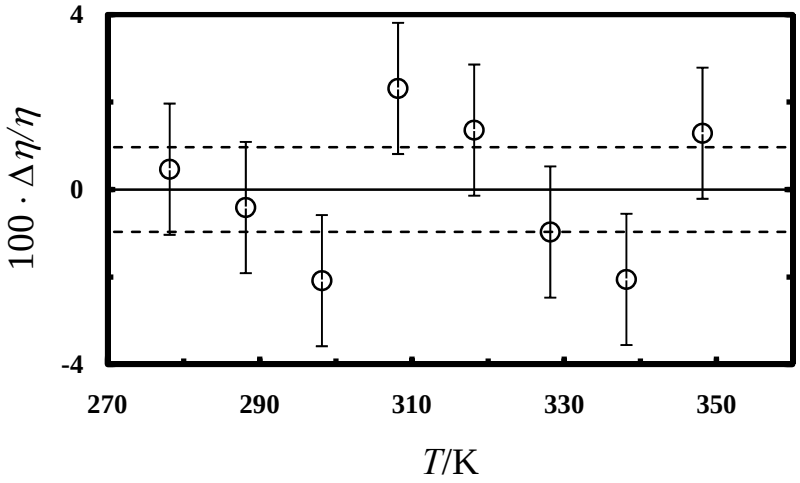

Figure S2.1 Relative deviations $\Delta\eta/\eta = (\eta-\eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid 1-hydroxyethylammonium formate as a function of temperature *T*. The combined (k = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm$ 1.0 represent the standard deviation of the fit to its data.

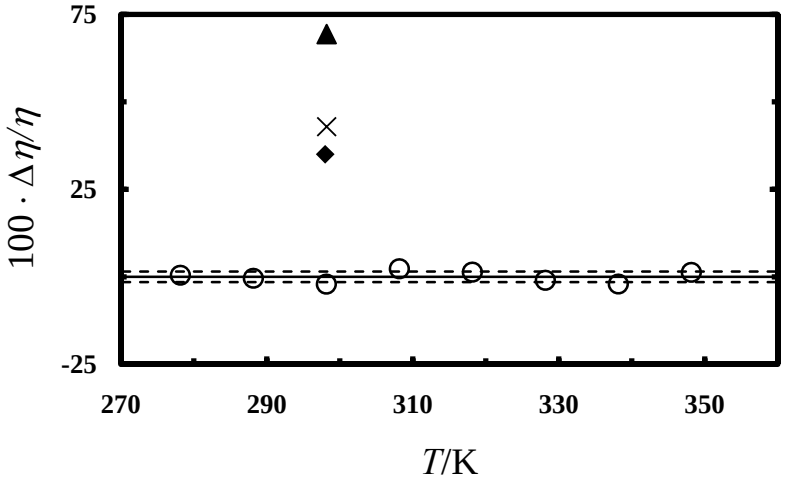

Figure S2.2 Relative deviations $\Delta\eta/\eta = (\eta-\eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid 1-hydroxyethylammonium formate as a function of temperature *T*. The dashed lines at $100\cdot\Delta\eta/\eta = \pm$ 1.5 represent the expanded uncertainty of the measurements. o this work; ▲ Greaves et al.; ▲ Bicak et al.; × Yuan et al.

Table S3 Conductivities κ of the ionic liquid 1-hydroxyethylammonium formate at elevated temperatures T

Compound	1-Hydroxyethylammonium formate
CASRN	53226-35-0
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$43 \cdot 10^{-4}$
Water mass fraction w of sample after measurement	$82 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Bicak *J. Mol. Liq.* 2005, *116*, 15-18. b) Greaves et al. *J. Phys. Chem B.* 2006, *110,* 22479-22487. c) Cota et al. *J. Phys. Chem. B* 2007, *111,* 12468-12477. d) Yuan et al. *J. Chem. Eng. Data* 2007, *52,* 596-599.
Comments on literature data	a) Atmosphere not specified, water content not specified, TetraCon 325 electrode with WTW Multiline P3. b) Atmosphere not specified, water content after measurement not specified, CDC 104 electrode with CDM 83 meter or Inlab R 750 laboratory conductive electrode with Mettler Toledo Seven Multi meter. Calibrated against Mettler Toledo standards. c) Atmosphere not specified, water content after measurement not specified, Jenway model 4150 conductivity meter. d) Water content after measurement not specified, DDS-307 conductivity meter.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i \qquad \text{where} \quad \kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$2.7 \cdot 10^{-3}$

Table S3 continued…

T	κ	κ_{eval}	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$\kappa \cdot 10^{-2}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$
278.15	0.229	0.229	-0.2	-9.1	38.0	-36.9	6.5
288.15	0.397	0.395	0.4	-9.1	36.6	-34.3	5.8
298.15	0.632	0.631	0.1	-9.1	35.4	-32.1	5.3
308.15	0.942	0.945	-0.3	-9.1	34.3	-30.0	4.8
318.15	1.331	1.334	-0.3	-9.1	33.2	-28.2	4.3
328.15	1.787	1.792	-0.3	-9.1	32.2	-26.5	3.9
338.15	2.329	2.305	1.1	-9.1	31.2	-24.9	3.6
348.15	2.837	2.852	-0.5	-9.1	30.3	-23.5	3.3

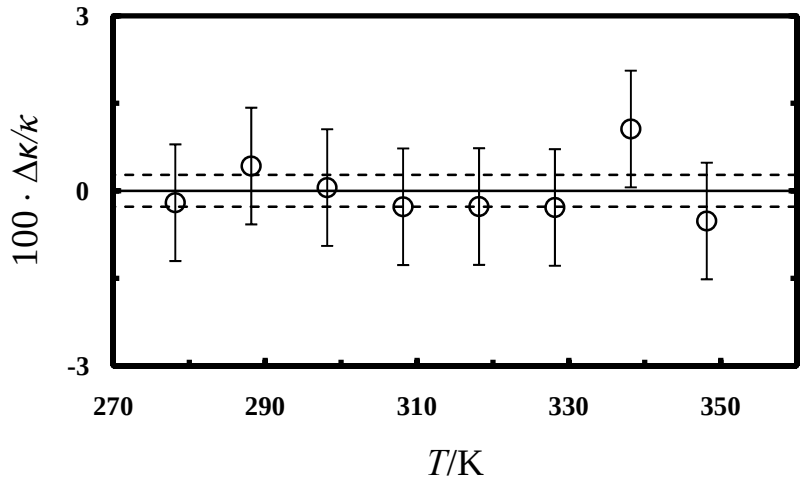

Figure S3.1 Relative deviations $\Delta\kappa/\kappa = (\kappa - \kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid 1-hydroxyethylammonium formate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 0.3$ represent the standard deviation of the fit to its data.

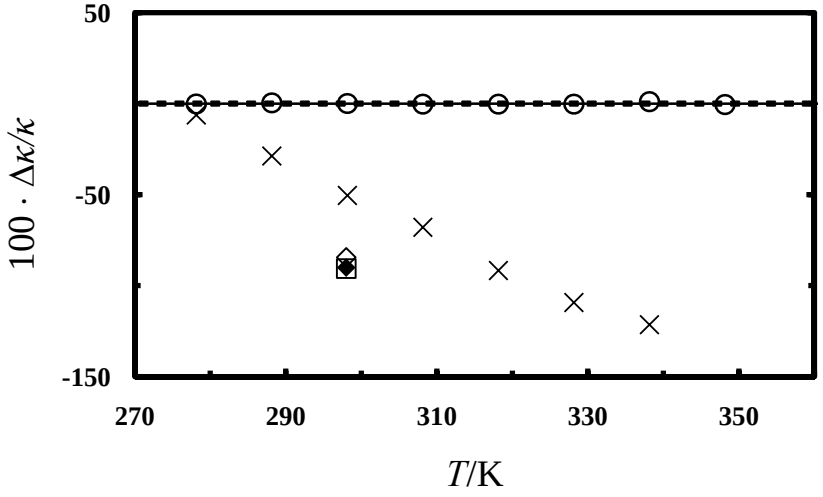

Figure S3.2 Relative deviations $\Delta\kappa/\kappa = (\kappa - \kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid 1-hydroxyethylammonium formate as a function of temperature T. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 1.0$ represent the expanded uncertainty of the measurements. ○ this work; ♦ Bicak et al.; ◊ Greaves et al.; □ Yuan et al.; × Cota et al.

2) 1-Hydroxyethylammonium acetate: [HEA]Ac

Table S4 Densities *ρ* of the ionic liquid 1-hydroxyethylammonium acetate at elevated temperatures *T*

Compound	1-Hydroxyethylammonium acetate
CASRN	54300-24-2
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	$\pm$ 0.02 K
Water mass fraction *w* of sample before measurement	$61 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$84 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Kurnia et al. *J. Chem. Thermodyn.* 2009, *41,* 517-521. b) Greaves et al. *J. Phys. Chem B.* 2006, *110,* 22479-22487. c) Yuan et al. *J. Chem. Eng. Data* 2007, *52,* 596-599.
Comments on literature data	a) Vacuum distillation of IL products, water content after measurement not specified, Anton-Paar Oscillating U-tube (DMA-5000) calibrated with Millipore water and other ILs. No degassing mentioned, measurements at open atmosphere. b) Atmosphere not specified, water content after measurement not specified, specific gravity bottle. c) Water content after measurement not specified, pycnometer.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.8 \cdot 10^{-4}$

Table S4 continued…

T	ρ	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	$\rho \cdot 10^{-2}$	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
278.15	1163.6	1163.9	0.0	1318.8	-154.9	n.a.	n.a.
288.15	1158.3	1158.4	0.0	1318.8	-160.4	n.a.	n.a.
298.15	1152.9	1152.8	0.0	1318.8	-166.0	n.a.	n.a.
308.15	1147.3	1147.2	0.0	1318.8	-171.6	n.a.	n.a.
318.15	1141.8	1141.7	0.0	1318.8	-177.1	n.a.	n.a.
328.15	1136.2	1136.1	0.0	1318.8	-182.7	n.a.	n.a.
338.15	1130.5	1130.5	0.0	1318.8	-188.3	n.a.	n.a.
348.15	1124.6	1125.0	0.0	1318.8	-193.8	n.a.	n.a.

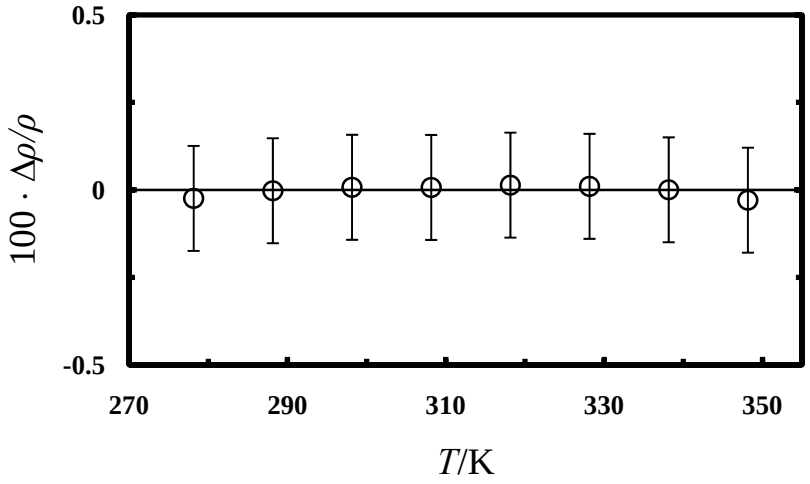

Figure S4.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid 1-hydroxyethylammonium acetate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.8\cdot10^{-2}$.

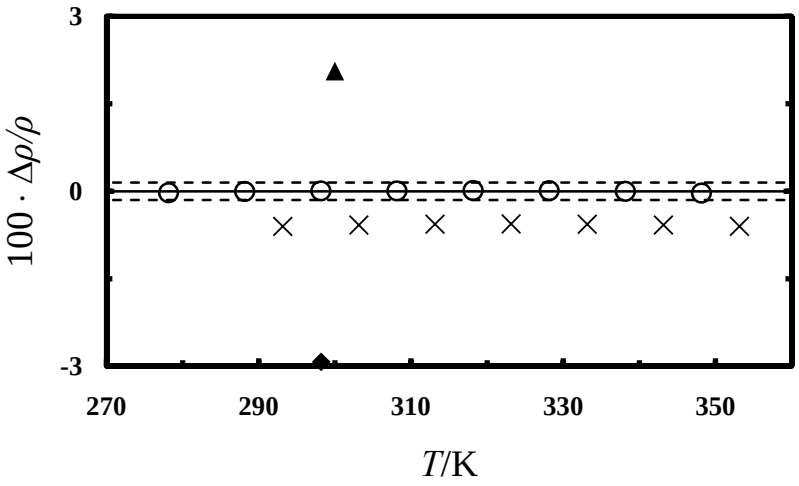

Figure S4.2 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid 1-hydroxyethylammonium acetate as a function of temperature T. The dashed lines at $100\cdot\Delta\rho/\rho = \pm 0.15$ represent the expanded uncertainty of the measurements. o this work; ▲ Greaves et al; ♦ Yuan et al.; × Kurnia et al.

Table S5 Viscosities η of the ionic liquid 1-hydroxyethylammonium acetate at elevated temperatures *T*

Compound	1-Hydroxyethylammonium acetate
CASRN	54300-24-2
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$61 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$84 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Kurnia et al. *J. Chem. Thermodyn.* 2009, *41,* 517-521. b) Greaves et al. *J. Phys. Chem B.* 2006, *110,* 22479-22487. c) Yuan et al. *J. Chem. Eng. Data* 2007, *52,* 596-599.
Comments on literature data	a) Vacuum distillation of IL products, water content after measurement not specified, Brookfield cone & plate (CAP 2000, L-series). No degassing mentioned, measurements at open atmosphere. b) Atmosphere not specified, water content after measurement not specified, Carri-Med CSL2 100 rheometer. c) Water content after measurement not specified, NDJ-1 rotary viscometer.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i \quad$ where $\quad \eta^0 = 1\ \mathrm{Pa{\cdot}s^{-1}}$
Standard deviation of fit function	$4.6 \cdot 10^{-3}$

T	η	η_{eval}	$(\eta-\eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
318.15	575	577	-0.3	2.5	0.1	10.6	n.a.
328.15	307	304	0.9	2.5	0.1	10.0	n.a.
338.15	167	169	-1.0	2.5	0.1	9.4	n.a.
348.15	99.2	98.9	0.4	2.5	0.1	8.9	n.a.

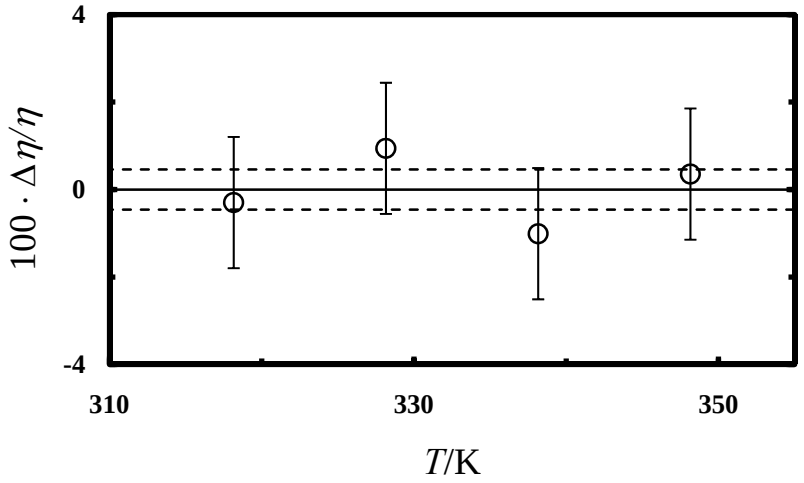

Figure S5.1 Relative deviations $\Delta\eta/\eta = (\eta-\eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid 1-hydroxyethylammonium acetate as a function of temperature *T*. The combined (k = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.5$ represent the standard deviation of the fit to its data.

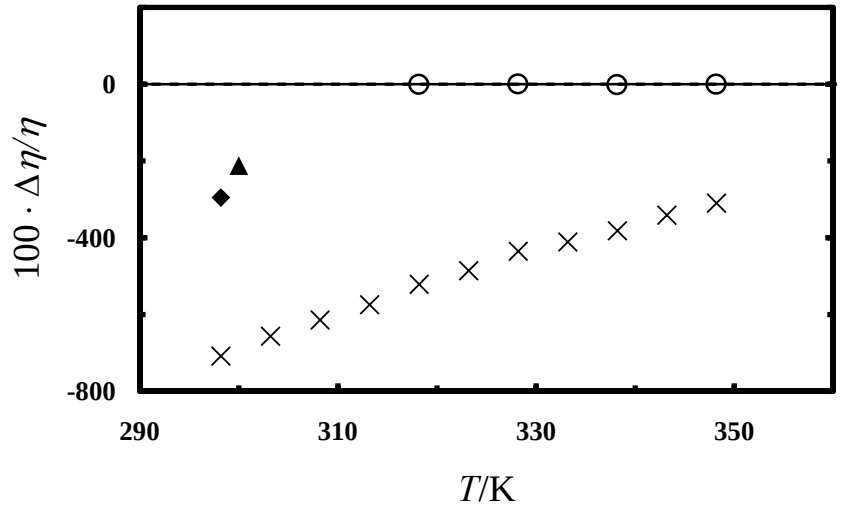

Figure S5.2 Relative deviations $\Delta\eta/\eta = (\eta-\eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid 1-hydroxyethylammonium acetate as a function of temperature *T*. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 1.5$ represent the expanded uncertainty of the measurements. o this work; ▲ Greaves et al.; ▲ Yuan et al.; × Kurnia et al.

Table S6 Conductivities κ of the ionic liquid 1-hydroxyethylammonium acetate at elevated temperatures T

Compound	1-Hydroxyethylammonium acetate
CASRN	54300-24-2
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$61 \cdot 10^{-4}$
Water mass fraction w of sample after measurement	$84 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Greaves et al. *J. Phys. Chem B.* 2006, *110,* 22479-22487. b) Yuan et al. *J. Chem. Eng. Data* 2007, *52,* 596-599.
Comments on literature data	a) Atmosphere not specified, water content after measurement not specified, CDC 104 electrode with CDM 83 meter or Inlab R 750 laboratory conductive electrode with Mettler Toledo Seven Multi meter. Calibrated against Mettler Toledo standards. b) Atmosphere not specified, water content after measurement not specified, Jenway model 4150 conductivity meter.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$0.5 \cdot 10^{-3}$

Table S6 continued…

T	κ	κ_{eval}	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$\kappa \cdot 10^{-2}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$
278.15	0.003	0.003	0.0	8.8	-18.4	24.5	-20.7
288.15	0.008	0.008	0.0	8.8	-17.8	22.8	-18.6
298.15	0.021	0.021	0.0	8.8	-17.2	21.3	-16.8
308.15	0.045	0.045	0.0	8.8	-16.6	20.0	-15.2
318.15	0.089	0.089	-0.2	8.8	-16.1	18.7	-13.8
328.15	0.162	0.162	0.2	8.8	-15.6	17.6	-12.6
338.15	0.272	0.272	-0.1	8.8	-15.1	16.6	-11.5
348.15	0.432	0.432	0.0	8.8	-14.7	15.6	-10.6

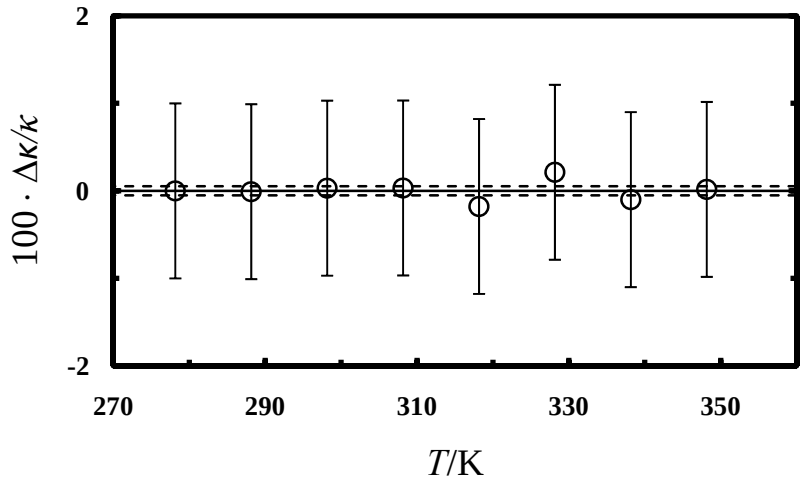

Figure S6.1 Relative deviations $\Delta\kappa/\kappa = (\kappa - \kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid 1-hydroxyethylammonium acetate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 0.1$ represent the standard deviation of the fit to its data.

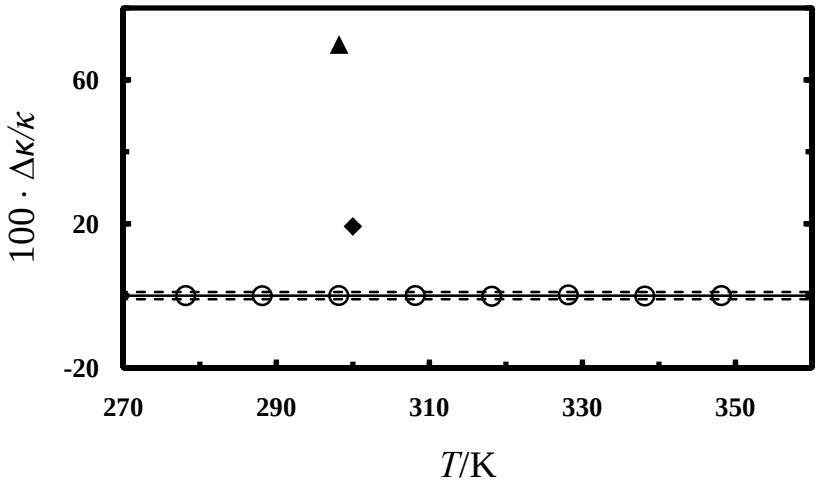

Figure S6.2 Relative deviations $\Delta\kappa/\kappa = (\kappa - \kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid 1-hydroxyethylammonium acetate as a function of temperature T. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 1.0$ represent the expanded uncertainty of the measurements. o this work; ♦ Greaves et al.; ▲ Yuan et al.

3) 1-Hydroxyethylammonium malonate: [HEA]Mal

Table S7 Densities *ρ* of the ionic liquid 1-hydroxyethylammonium malonate at elevated temperatures *T*

Compound	1-Hydroxyethylammonium malonate
CASRN	29870-14-2
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	$\pm$ 0.02 K
Water mass fraction *w* of sample before measurement	$66 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$93 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.4 \cdot 10^{-4}$

Table S7 continued…

T	ρ	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	$\rho \cdot 10^{-2}$	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
278.15	1347.2	1347.0	0.0	1545.6	-198.6	n.a.	n.a.
288.15	1339.8	1339.9	0.0	1545.6	-205.7	n.a.	n.a.
298.15	1332.7	1332.8	0.0	1545.6	-212.9	n.a.	n.a.
308.15	1325.5	1325.6	0.0	1545.6	-220.0	n.a.	n.a.
318.15	1318.4	1318.5	0.0	1545.6	-227.2	n.a.	n.a.
328.15	1311.4	1311.3	0.0	1545.6	-234.3	n.a.	n.a.
338.15	1304.2	1304.2	0.0	1545.6	-241.4	n.a.	n.a.
348.15	1297.1	1297.1	0.0	1545.6	-248.6	n.a.	n.a.

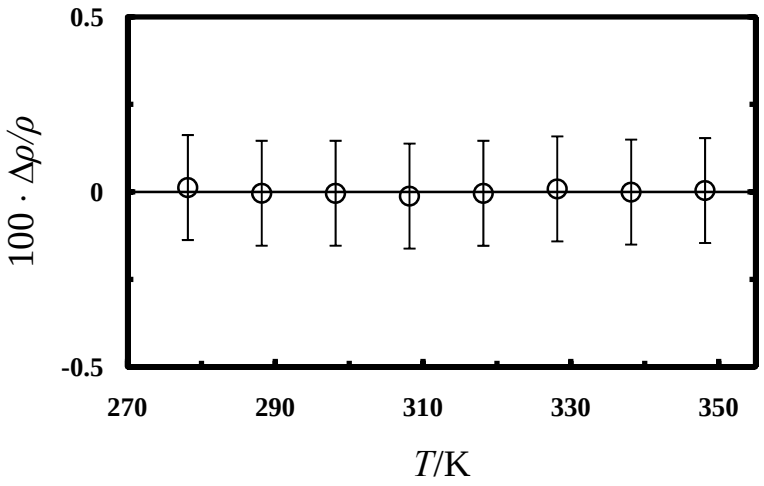

Figure S7.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid 1-hydroxyethylammonium malonate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.4\cdot10^{-2}$.

Table S8 Viscosities η of the ionic liquid 1-hydroxyethylammonium malonate at elevated temperatures *T*

Compound	1-Hydroxyethylammonium malonate
CASRN	29870-14-2
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$66 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$93 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\eta^0 = 1$ Pa·s^{-1}
Standard deviation of fit function	$0.2 \cdot 10^{-5}$

T	η	η_{eval}	$(\eta - \eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
338.15	817	817	**0.0**	**211.9**	**-428.0**	**229.7**	n.a.
348.15	401	401	**0.0**	**211.9**	**-415.7**	**216.7**	n.a.
358.15	290	290	**0.0**	**211.9**	**-404.1**	**204.8**	n.a.

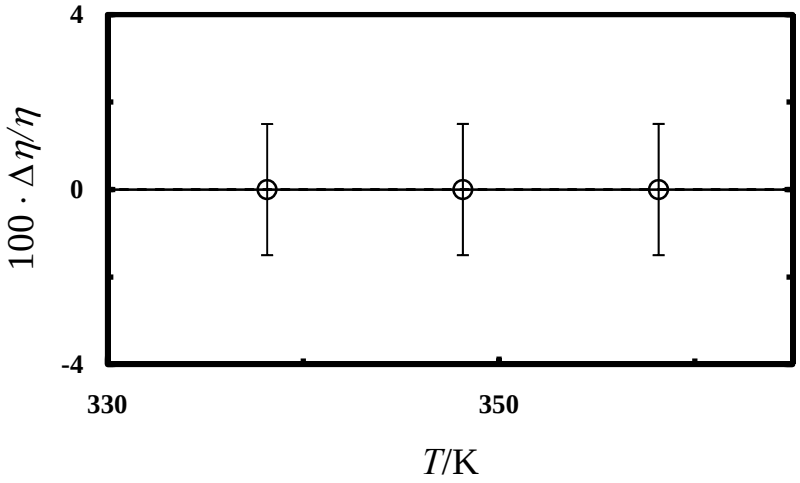

Figure S8.1 Relative deviations $\Delta\eta/\eta = (\eta-\eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid 1-hydroxyethylammonium malonate as a function of temperature *T*. The combined (k = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.2\cdot10^{-3}$ represent the standard deviation of the fit to its data.

Table S9 Conductivities κ of the ionic liquid 1-hydroxyethylammonium malonate at elevated temperatures T

Compound	1-Hydroxyethylammonium malonate
CASRN	29870-14-2
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$66 \cdot 10^{-4}$
Water mass fraction w of sample after measurement	$93 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i \quad$ where $\kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$0.8 \cdot 10^{-3}$

T	$10^2 \cdot \kappa$	$10^2 \cdot \kappa_{eval}$	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	S·m^{-1}	S·m^{-1}	$\kappa \cdot 10^{-2}$	S·m^{-1}	S·m^{-1}	S·m^{-1}	S·m^{-1}
278.15	0.009	0.009	-0.6	-28.6	90.2	-77.4	6.6
288.15	0.042	0.042	1.0	-28.6	87.0	-72.2	5.9
298.15	0.149	0.148	0.6	-28.6	84.1	-67.4	5.3
308.15	0.428	0.432	-0.9	-28.6	81.4	-63.1	4.8
318.15	1.054	1.069	-1.4	-28.6	78.8	-59.2	4.4
328.15	2.286	2.291	-0.2	-28.6	76.4	-55.6	4.0
338.15	4.465	4.337	2.9	-28.6	74.2	-52.4	3.6
348.15	7.266	7.377	-1.5	-28.6	72.0	-49.4	3.3

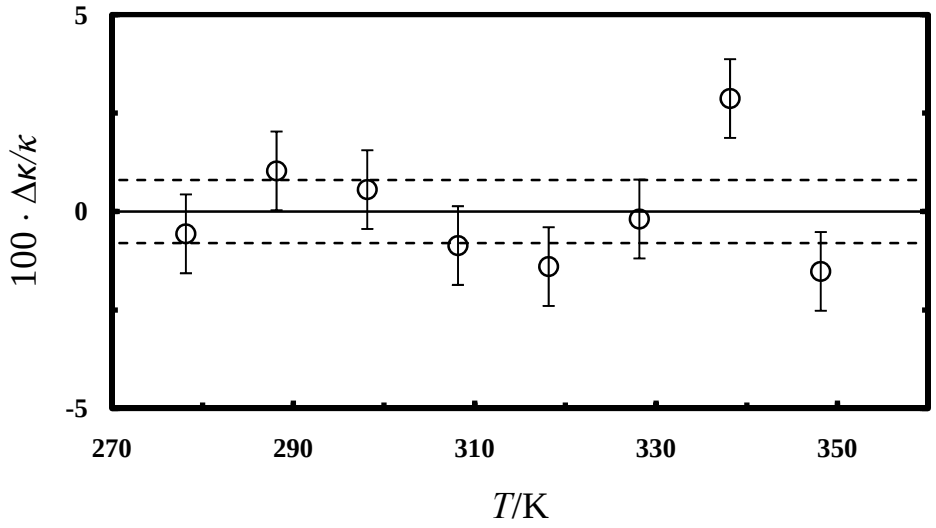

Figure S9.1 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid 1-hydroxyethylammonium malonate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.1$ represent the standard deviation of the fit to its data.

4) Bis(2-hydroxyethyl)ammonium formate: [DEA]Fmt

Table S10 Densities *ρ* of the ionic liquid bis(2-hydroxyethyl)ammonium formate at elevated temperatures *T*

Compound	Bis(2-hydroxyethyl)ammonium formate
CASRN	68391-54-8
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	$\pm$ 0.02 K
Water mass fraction *w* of sample before measurement	$43 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$88 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Cota et al. *J. Phys. Chem. B* 2007, *111,* 12468-12477. b) Greaves et al. *J. Phys. Chem. B* 2010, *114,* 10022-10031. c) Burrell et al. *Phys. Chem. Chem. Phys.* 2010, *12,* 1571-1577.
Comments on literature data	a) Atmosphere not specified, water content not specified, Anton-Paar DAS 5000 vibrational tube, calibrated with Millipore water. e) Atmosphere not specified, water content after measurement not specified, instrument and temperature not specified. b) Atmosphere not specified, water content after measurement not specified, temperature not given, Anton-Paar DMA 4100 M.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.1 \cdot 10^{-3}$

Table S10 continued…

T	ρ	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	$\rho \cdot 10^{-2}$	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
278.15	1230.7	1230.9	0.0	1394.2	-163.3	n.a.	n.a.
288.15	1225.0	1225.1	0.0	1394.2	-169.1	n.a.	n.a.
298.15	1219.3	1219.2	0.0	1394.2	-175.0	n.a.	n.a.
308.15	1213.4	1213.3	0.0	1394.2	-180.9	n.a.	n.a.
318.15	1207.7	1207.4	0.0	1394.2	-186.8	n.a.	n.a.
328.15	1201.8	1201.6	0.0	1394.2	-192.6	n.a.	n.a.
338.15	1195.8	1195.7	0.0	1394.2	-198.5	n.a.	n.a.
348.15	1189.4	1189.8	0.0	1394.2	-204.4	n.a.	n.a.

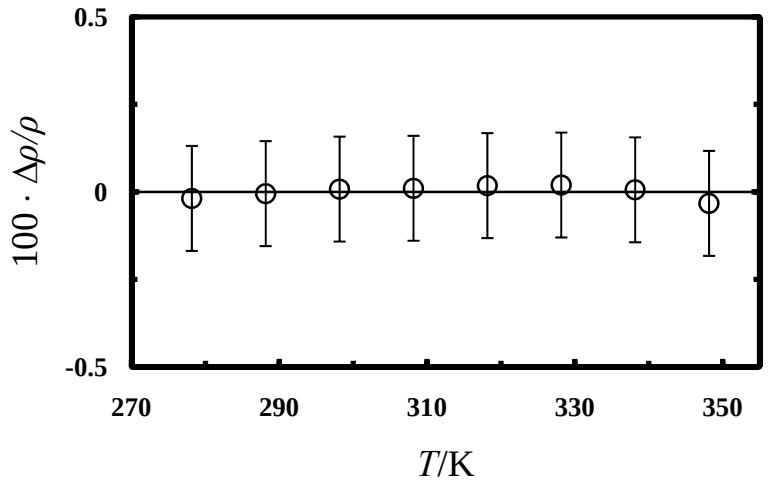

Figure S10.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid bis(2-hydroxyethyl)ammonium formate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.1\cdot10^{-1}$.

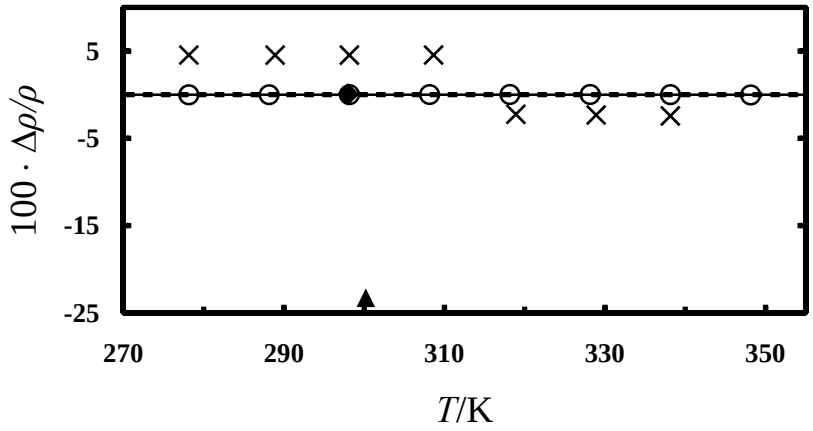

Figure S10.2 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid bis(2-hydroxyethyl)ammonium formate as a function of temperature T. The dashed lines at $100\cdot\Delta\rho/\rho = \pm 0.15$ represent the expanded uncertainty of the measurements. o this work; ▲ Greaves et al; ♦ Burrell et al.; × Cota et al.

Table S11 Viscosities η of the ionic liquid bis(2-hydroxyethyl)ammonium formate at elevated temperatures *T*

Compound	Bis(2-hydroxyethyl)ammonium formate
CASRN	68391-54-8
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$43 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$88 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Greaves et al. *J. Phys. Chem. B* 2010, *114,* 10022-10031. b) Burrell et al. *Phys. Chem. Chem. Phys.* 2010, *12,* 1571-1577.
Comments on literature data	a) Atmosphere not specified, water content after measurement not specified, instrument and temperature not specified. b) Atmosphere not specified, water content after measurement not specified, temperature not given, TA intruments AR-G2 cone & plate rheometer.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\eta^0 = 1$ Pa·s^{-1}
Standard deviation of fit function	$7.8 \cdot 10^{-3}$

T	η	η_{eval}	$(\eta-\eta_{eval})$	***A*$_0$**	***A*$_1$**	***A*$_2$**	***A*$_3$**
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
298.15	951	956	-0.5	151.6	-484.9	537.8	-190.7
308.15	518	509	1.8	151.6	-469.2	503.5	-172.7
318.15	269	273	-1.8	151.6	-454.4	472.3	-157.0
328.15	152	153	-0.5	151.6	-440.6	444.0	-143.0
338.15	92.1	90.7	1.5	151.6	-427.6	418.1	-130.7
348.15	57.6	58.0	-0.6	151.6	-415.3	394.4	-119.8

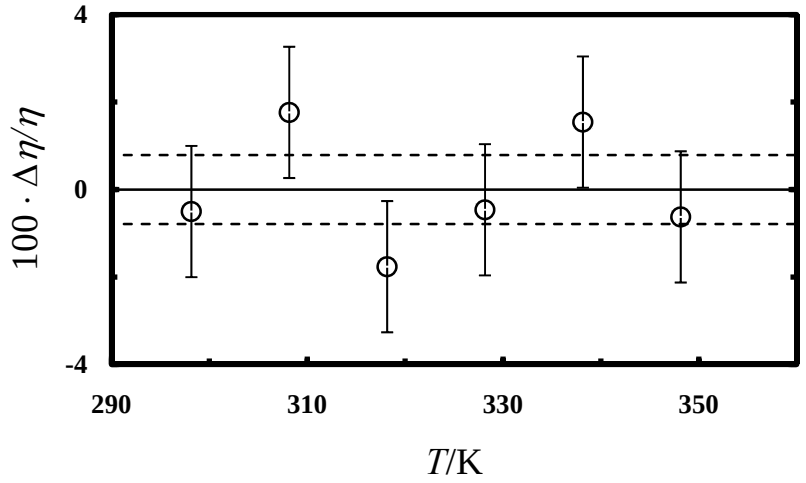

Figure S11.1 Relative deviations $\Delta\eta/\eta = (\eta-\eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid bis(2-hydroxyethyl)ammonium formate as a function of temperature *T*. The combined (*k* = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.8$ represent the standard deviation of the fit to its data.

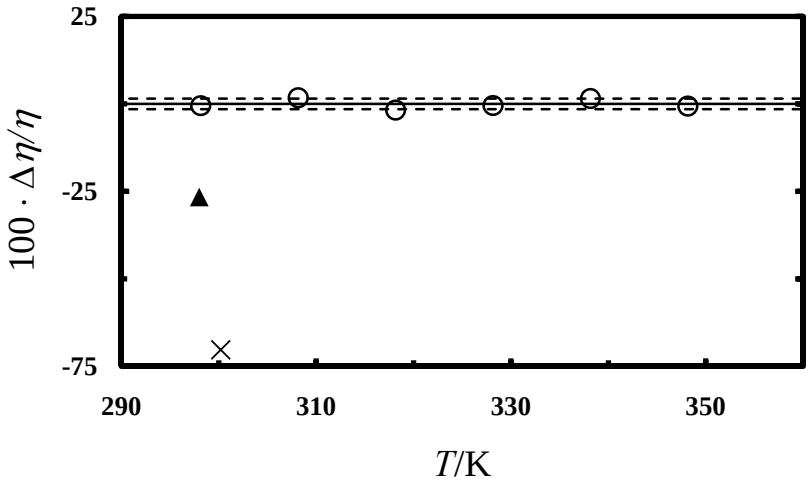

Figure S11.2 Relative deviations $\Delta\eta/\eta = (\eta-\eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid bis(2-hydroxyethyl)ammonium formate as a function of temperature *T*. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 1.5$ represent the expanded uncertainty of the measurements. o this work; ▲ Burrell et al.; × Greaves et al.

Table S12 Conductivities κ of the ionic liquid bis(2-hydroxyethyl)ammonium formate at elevated temperatures T

Compound	Bis(2-hydroxyethyl)ammonium formate
CASRN	68391-54-8
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$43 \cdot 10^{-4}$
Water mass fraction w of sample after measurement	$88 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Cota et al. *J. Phys. Chem. B* 2007, *111,* 12468-12477. b) Greaves et al. *J. Phys. Chem. B* 2010, *114,* 10022-10031. c) Burrell et al. *Phys. Chem. Chem. Phys.* 2010, *12,* 1571-1577.
Comments on literature data	a) Atmosphere not specified, water content after measurement not specified, Jenway model 4150 conductivity meter. b) Atmosphere not specified, water content after measurement not specified, instrument not specified. c) Atmosphere not specified, water content after measurement not specified, impedance measurement (0.1 and 1) MHz with Solartron 1260 response analyser.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$4.2 \cdot 10^{-3}$

Table S12 continued…

T	κ	κ_{eval}	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$\kappa \cdot 10^{-2}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$
278.15	0.010	0.010	0.0	7.7	-17.0	24.3	-19.5
288.15	0.026	0.026	0.0	7.7	-16.4	22.7	-17.6
298.15	0.055	0.055	0.2	7.7	-15.9	21.2	-15.8
308.15	0.106	0.106	-0.2	7.7	-15.4	19.8	-14.4
318.15	0.187	0.187	-0.1	7.7	-14.9	18.6	-13.0
328.15	0.307	0.306	0.2	7.7	-14.4	17.5	-11.9
338.15	0.453	0.472	-4.2	7.7	-14.0	16.5	-10.9
348.15	0.690	0.690	0.0	7.7	-13.6	15.5	-10.0

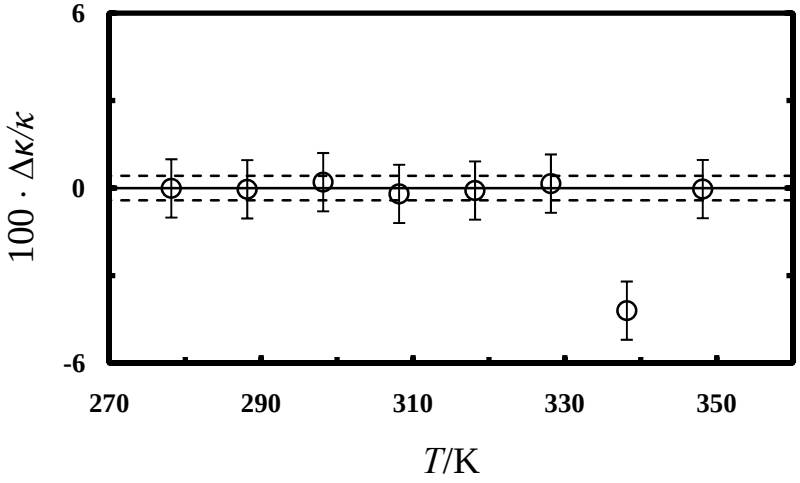

Figure S12.1 Relative deviations $\Delta\kappa/\kappa = (\kappa - \kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid bis(2-hydroxyethyl)ammonium formate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 0.4$ represent the standard deviation of the fit to its data. The experimental value at 338.15 K was excluded for the determination of the fit equation.

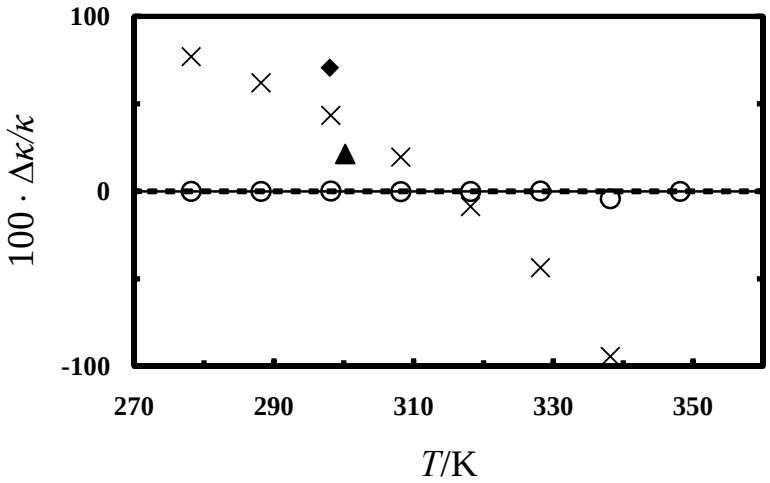

Figure S12.2 Relative deviations $\Delta\kappa/\kappa = (\kappa - \kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid bis(2-hydroxyethyl)ammonium formate as a function of temperature T. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 1.0$ represent the expanded uncertainty of the measurements. o this work; ♦ Burrell et al.; ▲ Greaves et al.; × Cota et al.

5) Bis(2-hydroxyethyl)ammonium acetate: [DEA]acetate

Table S13 Densities *ρ* of the ionic liquid bis(2-hydroxyethyl)ammonium acetate at elevated temperatures *T*

Compound	Bis(2-hydroxyethyl)ammonium acetate
CASRN	23251-72-1
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	$\pm$ 0.02 K
Water mass fraction *w* of sample before measurement	$46 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$85 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Kurnia et al. *J. Chem. Thermodyn.* 2009, *41,* 517-521. b) Zhao et al. *J. Chem. Phys. B* 2008, *112,* 6923-6936. c) Burrell et al. *Phys. Chem. Chem. Phys.* 2010, *12,* 1571-1577.
Comments on literature data	a) Vacuum distillation of IL products, water content after measurement not specified, Anton-Paar Oscillating U-tube (DMA-5000) calibrated with Millipore water and other ILs. No degassing mentioned, measurements at open atmosphere. b) Atmosphere not specified, water content after measurement not specified, weighing of volumetric flask. c) Atmosphere not specified, water content after measurement not specified, temperature not given, Anton-Paar DMA 4100 M.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.9 \cdot 10^{-4}$

Table S13 continued…

T	ρ	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	$\rho \cdot 10^{-2}$	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
278.15	1190.4	1190.6	0.0	1371.1	-180.5	n.a.	n.a.
288.15	1184.1	1184.1	0.0	1371.1	-187.0	n.a.	n.a.
298.15	1177.7	1177.6	0.0	1371.1	-193.4	n.a.	n.a.
308.15	1171.3	1171.2	0.0	1371.1	-199.9	n.a.	n.a.
318.15	1164.9	1164.7	0.0	1371.1	-206.4	n.a.	n.a.
328.15	1158.4	1158.2	0.0	1371.1	-212.9	n.a.	n.a.
338.15	1151.7	1151.7	0.0	1371.1	-219.4	n.a.	n.a.
348.15	1144.9	1145.2	0.0	1371.1	-225.9	n.a.	n.a.

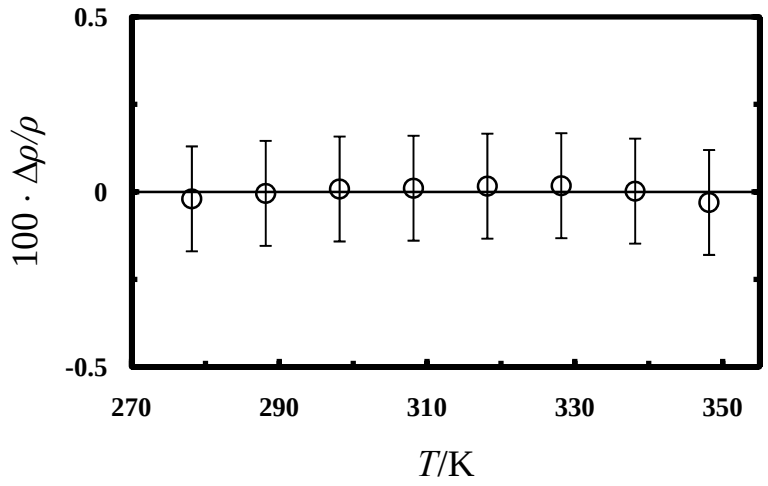

Figure S13.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid bis(2-hydroxyethyl)ammonium acetate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.1\cdot10^{-1}$.

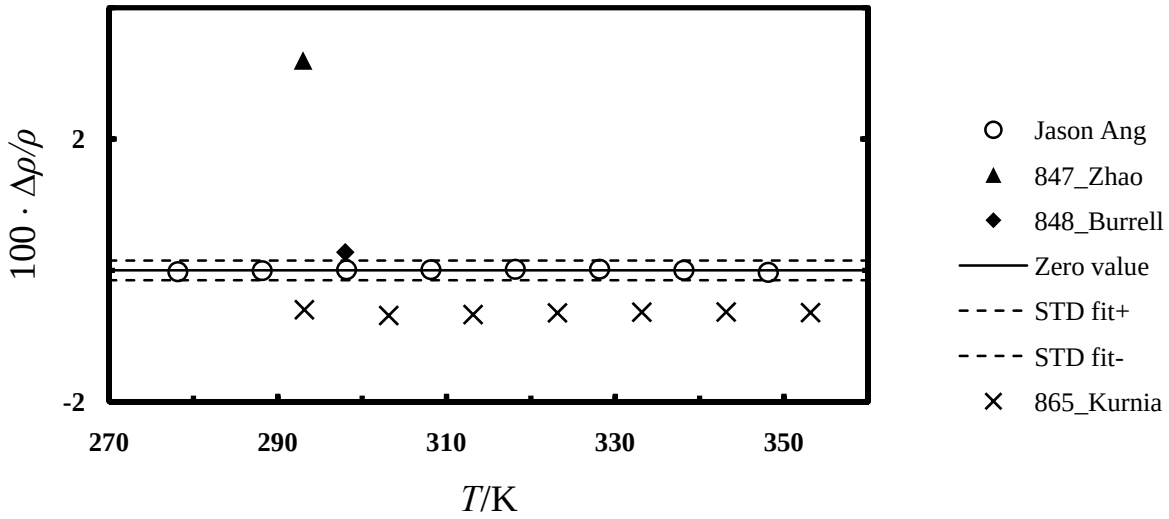

Figure S13.2 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid bis(2-hydroxyethyl)ammonium acetate as a function of temperature T. The dashed lines at $100\cdot\Delta\rho/\rho = \pm 0.15$ represent the expanded uncertainty of the measurements. o this work; ▲ Zhao et al; ♦ Burrell et al.; × Kurnia et al.

Table S14 Viscosities η of the ionic liquid bis(2-hydroxyethyl)ammonium acetate at elevated temperatures *T*

Compound	Bis(2-hydroxyethyl)ammonium acetate
CASRN	23251-72-1
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$46 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$85 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Kurnia et al. *J. Chem. Thermodyn.* 2009, *41,* 517-521. b) Zhao et al. *J. Chem. Phys. B* 2008, *112,* 6923-6936. c) Burrell et al. *Phys. Chem. Chem. Phys.* 2010, *12,* 1571-1577.
Comments on literature data	a) Vacuum distillation of IL products, water content after measurement not specified, Brookfield cone & plate (CAP 2000, L-series). No degassing mentioned, measurements at open atmosphere. b) Atmosphere not specified, water content after measurement not specified, Schott micro-Ubbelhode capillary viscometer. c) Atmosphere not specified, water content after measurement not specified, temperature not given, TA intruments AR-G2 cone & plate rheometer.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i \quad$ where $\quad \eta^0 = 1\ \mathrm{Pa{\cdot}s^{-1}}$
Standard deviation of fit function	$0.7 \cdot 10^{-3}$

T	η	η_{eval}	$(\eta-\eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
318.15	711	711	0.0	106.5	-327.5	353.5	-119.1
328.15	360	360	0.1	106.5	-317.5	332.3	-108.5
338.15	191	192	-0.2	106.5	-308.1	313.0	-99.2
348.15	109	109	0.1	106.5	-299.3	295.2	-90.9
358.15	65.9	65.9	0.0	106.5	-290.9	279.0	-83.5

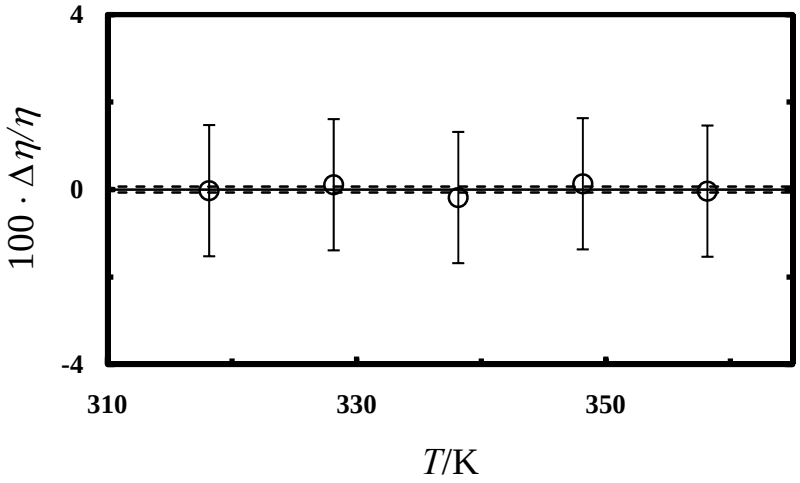

Figure S14.1 Relative deviations $\Delta\eta/\eta = (\eta-\eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid bis(2-hydroxyethyl)ammonium acetate as a function of temperature *T*. The combined (*k* = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.7\cdot10^{-1}$ represent the standard deviation of the fit to its data.

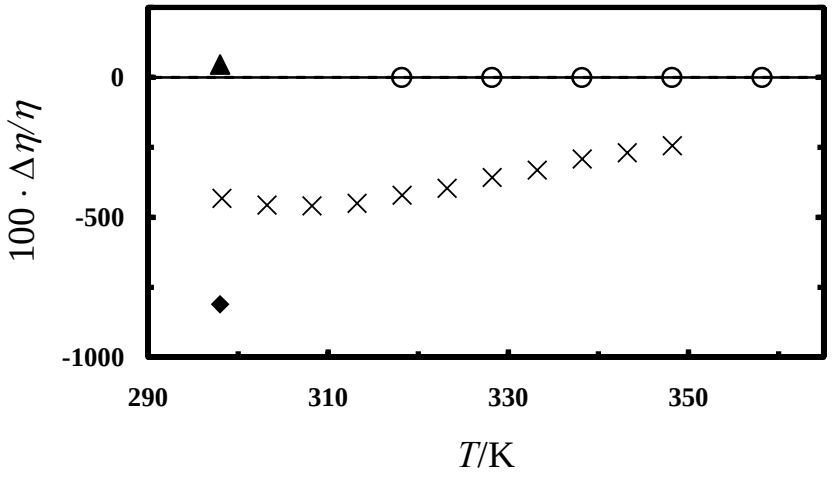

Figure S14.2 Relative deviations $\Delta\eta/\eta = (\eta-\eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid bis(2-hydroxyethyl)ammonium acetate as a function of temperature *T*. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 1.5$ represent the expanded uncertainty of the measurements. o this work; ▲ Burrell et al.; ♦ Zhao et al.; × Kurnia et al.

Table S15 Conductivities *κ* of the ionic liquid bis(2-hydroxyethyl)ammonium acetate at elevated temperatures *T*

Compound	Bis(2-hydroxyethyl)ammonium acetate
CASRN	23251-72-1
Purity	single phase
Physical property	electrical conductivity
Combined expanded (*k* = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature *T*	± 0.01 K
Water mass fraction *w* of sample before measurement	$46 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$85 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Zhao et al. *J. Chem. Phys. B* 2008, *112,* 6923-6936. b) Burrell et al. *Phys. Chem. Chem. Phys.* 2010, *12,* 1571-1577.
Comments on literature data	a) Atmosphere not specified, water content after measurement not specified, impedance measurement (0.1 and 1) MHz with Solartron 1260 response analyser. b) Atmosphere not specified, water content after measurement not specified, impedance measurement (0.1 and 1) MHz with Solartron 1260 response analyser.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i \qquad \text{where} \quad \kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$0.3 \cdot 10^{-3}$

Table S15 continued…

T	κ	κ_{eval}	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$\kappa \cdot 10^{-2}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$
278.15	0.002	0.002	0.0	5.0	-5.9	10.2	-15.6
288.15	0.005	0.005	0.0	5.0	-5.7	9.5	-14.0
298.15	0.013	0.013	0.0	5.0	-5.6	8.8	-12.6
308.15	0.028	0.028	-0.1	5.0	-5.4	8.3	-11.4
318.15	0.057	0.057	0.1	5.0	-5.2	7.8	-10.4
328.15	0.105	0.105	0.0	5.0	-5.0	7.3	-9.5
338.15	0.181	0.181	0.0	5.0	-4.9	6.9	-8.7
348.15	0.291	0.291	0.0	5.0	-4.8	6.5	-7.9

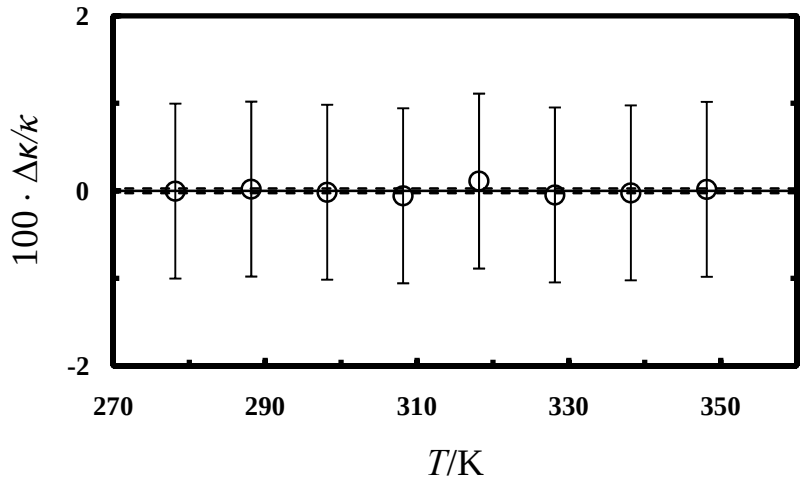

Figure S15.1 Relative deviations $\Delta\kappa/\kappa = (\kappa - \kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid bis(2-hydroxyethyl)ammonium acetate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 0.3 \cdot 10^{-1}$ represent the standard deviation of the fit to its data.

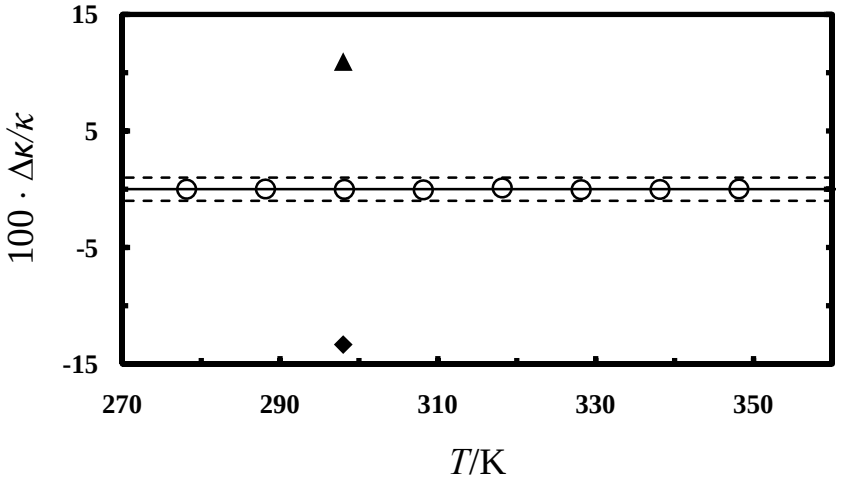

Figure S15.2 Relative deviations $\Delta\kappa/\kappa = (\kappa - \kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid bis(2-hydroxyethyl)ammonium acetate as a function of temperature T. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 1.0$ represent the expanded uncertainty of the measurements. o this work; ♦ Burrell et al.; ▲ Zhao et al.

6) Bis(2-hydroxyethyl)ammonium malonate: [DEA]Mal

Table S16 Densities *ρ* of the ionic liquid bis(2-hydroxyethyl)ammonium malonate at elevated temperatures *T*

Compound	Bis(2-hydroxyethyl)ammonium malonate
CASRN	29870-26-6
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	$\pm$ 0.02 K
Water mass fraction *w* of sample before measurement	$39 \cdot 10^{-3}$
Water mass fraction *w* of sample after measurement	$44 \cdot 10^{-3}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.5 \cdot 10^{-4}$

T	ρ	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	$\rho \cdot 10^{-2}$	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
278.15	1253.4	1253.5	0.0	1429.9	-176.4	n.a.	n.a.
288.15	1247.1	1247.2	0.0	1429.9	-182.8	n.a.	n.a.
298.15	1240.9	1240.8	0.0	1429.9	-189.1	n.a.	n.a.
308.15	1234.5	1234.5	0.0	1429.9	-195.5	n.a.	n.a.
318.15	1228.2	1228.1	0.0	1429.9	-201.8	n.a.	n.a.
328.15	1222.0	1221.8	0.0	1429.9	-208.2	n.a.	n.a.
338.15	1215.6	1215.4	0.0	1429.9	-214.5	n.a.	n.a.
348.15	1208.8	1209.1	0.0	1429.9	-220.8	n.a.	n.a.

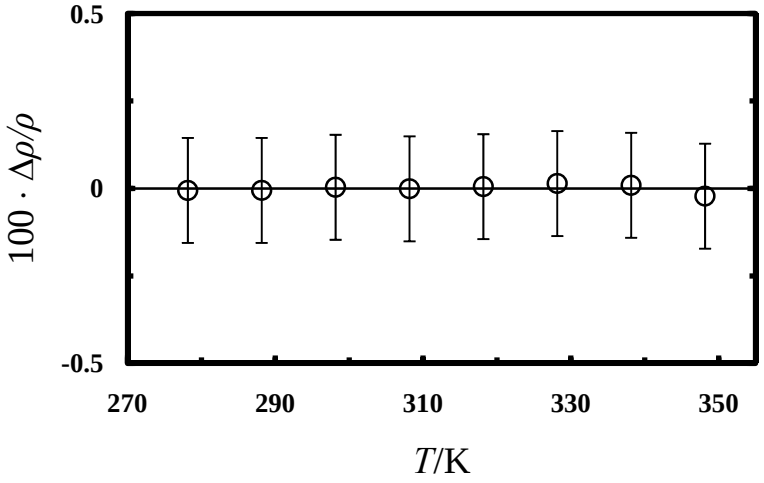

Figure S16.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid bis(2-hydroxyethyl)ammonium malonate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.5\cdot10^{-2}$.

Table S17 Viscosities η of the ionic liquid bis(2-hydroxyethyl)ammonium malonate at elevated temperatures *T*

Compound	Bis(2-hydroxyethyl)ammonium malonate
CASRN	29870-26-6
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$39 \cdot 10^{-3}$
Water mass fraction *w* of sample after measurement	$44 \cdot 10^{-3}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\eta^0 = 1$ Pa·s^{-1}
Standard deviation of fit function	$1.5 \cdot 10^{-3}$

T	η	η_{eval}	$(\eta - \eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
328.15	489	489	0.1	15.0	-25.5	23.6	n.a.
338.15	262	262	-0.3	15.0	-24.8	22.3	n.a.
348.15	152	152	0.3	15.0	-24.1	21.0	n.a.
358.15	93.2	93.3	-0.1	15.0	-23.4	19.8	n.a.

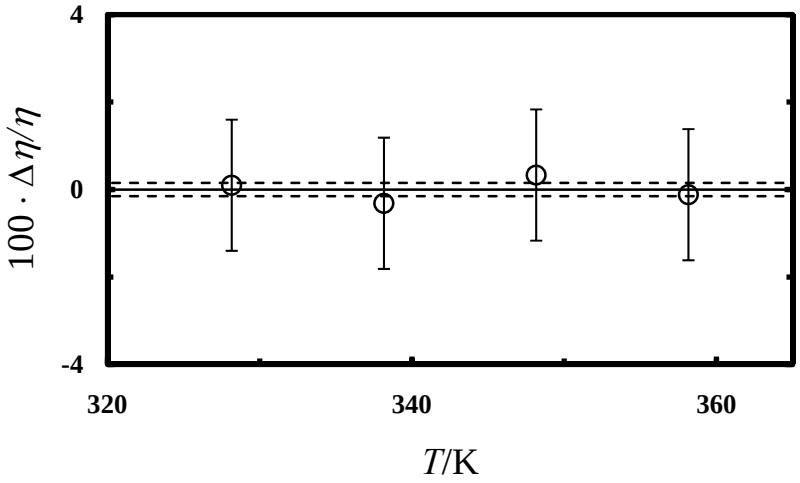

Figure S17.1 Relative deviations $\Delta\eta/\eta = (\eta - \eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid bis(2-hydroxyethyl)ammonium malonate as a function of temperature *T*. The combined (k = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 0.2$ represent the standard deviation of the fit to its data.

Table S18 Conductivities κ of the ionic liquid bis(2-hydroxyethyl)ammonium malonate at elevated temperatures T

Compound	Bis(2-hydroxyethyl)ammonium malonate
CASRN	29870-26-6
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$39 \cdot 10^{-3}$
Water mass fraction w of sample after measurement	$44 \cdot 10^{-3}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$1.7 \cdot 10^{-3}$

Table S18 continued…

T	$\kappa \cdot 10^2$	$10^2 \cdot \kappa_{eval}$	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$\kappa \cdot 10^{-2}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$
278.15	0.064	0.064	0.0	13.7	-39.1	49.4	-31.3
288.15	0.200	0.200	-0.1	13.7	-37.8	46.0	-28.1
298.15	0.530	0.528	0.3	13.7	-36.5	43.0	-25.4
308.15	1.211	1.217	-0.5	13.7	-35.3	40.2	-23.0
318.15	2.518	2.506	0.5	13.7	-34.2	37.7	-20.9
328.15	4.693	4.708	-0.3	13.7	-33.2	35.5	-19.0
338.15	8.206	8.194	0.1	13.7	-32.2	33.4	-17.4
348.15	13.38	13.38	0.0	13.7	-31.2	31.5	-15.9

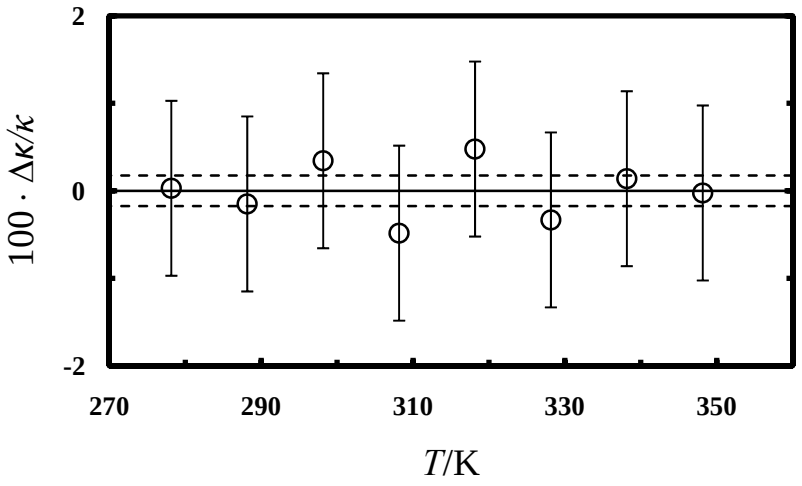

Figure S18.1 Relative deviations $\Delta\kappa/\kappa = (\kappa - \kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid bis(2-hydroxyethyl)ammonium malonate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 0.2$ represent the standard deviation of the fit to its data.

7) Tris(2-hydroxyethyl)ammonium formate: [TEA]Fmt

Table S19 Densities *ρ* of the ionic liquid tris(2-hydroxyethyl)ammonium formate at elevated temperatures *T*

Compound	Tris(2-hydroxyethyl)ammonium formate
CASRN	24794-58-9
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	± 0.02 K
Water mass fraction *w* of sample before measurement	$60 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$91 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	Cota et al. *J. Phys. Chem. B* 2007, *111,* 12468-12477.
Comments on literature data	Atmosphere not specified, water content not specified, Anton-Paar DAS 5000 vibrational tube, calibrated with Millipore water.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.8 \cdot 10^{-4}$

T	***ρ***	***ρ_{eval}***	***(ρ-ρ_{eval})***	***A₀***	***A₁***	***A₂***	***A₃***
K	**kg·m^{-3}**	**kg·m^{-3}**	**ρ ·10^{-2}**	**kg·m^{-3}**	**kg·m^{-3}**	**kg·m^{-3}**	**kg·m^{-3}**
318.15	1220.1	1220.3	0.0	1436.7	-216.4	n.a.	n.a.
328.15	1213.7	1213.5	0.0	1436.7	-223.2	n.a.	n.a.
338.15	1206.8	1206.7	0.0	1436.7	-230.0	n.a.	n.a.
348.15	1199.8	1199.9	0.0	1436.7	-236.8	n.a.	n.a.
358.15	1193.0	1193.1	0.0	1436.7	-243.6	n.a.	n.a.

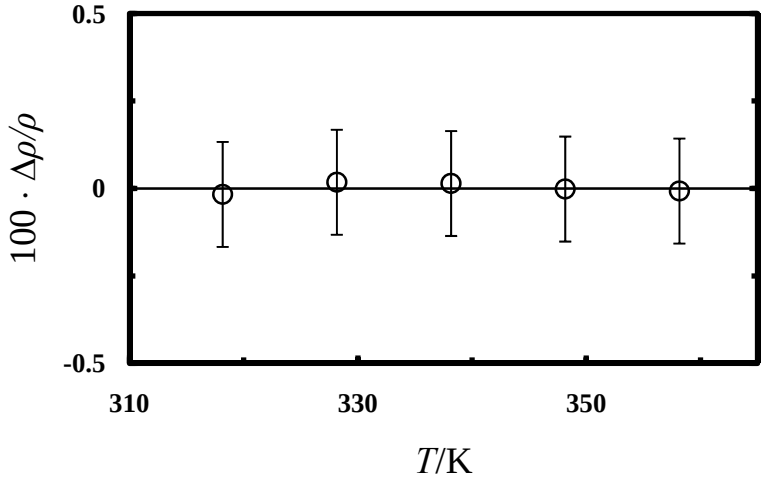

Figure S19.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid tris(2-hydroxyethyl)ammonium formate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.8\cdot10^{-2}$.

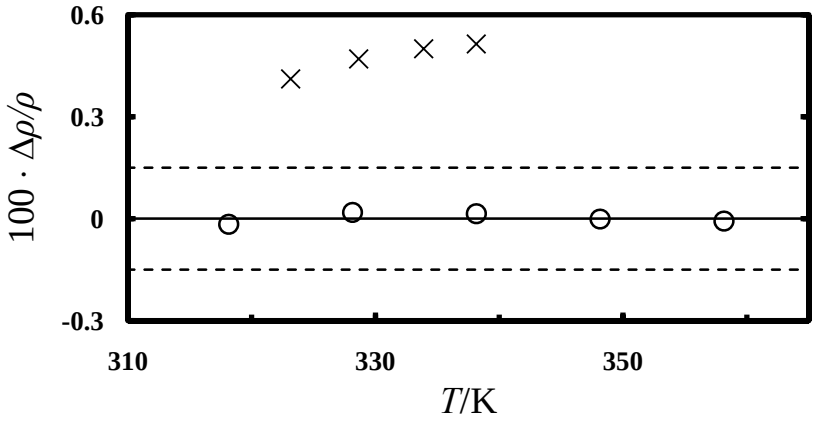

Figure S19.2 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid tris(2-hydroxyethyl)ammonium formate as a function of temperature T. The dashed lines at $100\cdot\Delta\rho/\rho = \pm 0.15$ represent the expanded uncertainty of the measurements. o this work; × Cota et al.

Table S20 Viscosities η of the ionic liquid tris(2-hydroxyethyl)ammonium formate at elevated temperatures *T*

Compound	Tris(2-hydroxyethyl)ammonium formate
CASRN	24794-58-9
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$60 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$91 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i \quad$ where $\quad \eta^0 = 1\ \mathrm{Pa{\cdot}s^{-1}}$
Standard deviation of fit function	$1.1 \cdot 10^{-3}$

T	η	η_{eval}	$(\eta-\eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
318.15	321	321	0.0	-85.3	280.2	-286.8	104.6
328.15	177	176	0.2	-85.3	271.7	-269.6	95.3
338.15	103	103	-0.3	-85.3	263.7	-253.9	87.1
348.15	63.4	63.3	0.2	-85.3	256.1	-239.5	79.8
358.15	39.8	39.8	-0.1	-85.3	248.9	-226.3	73.3

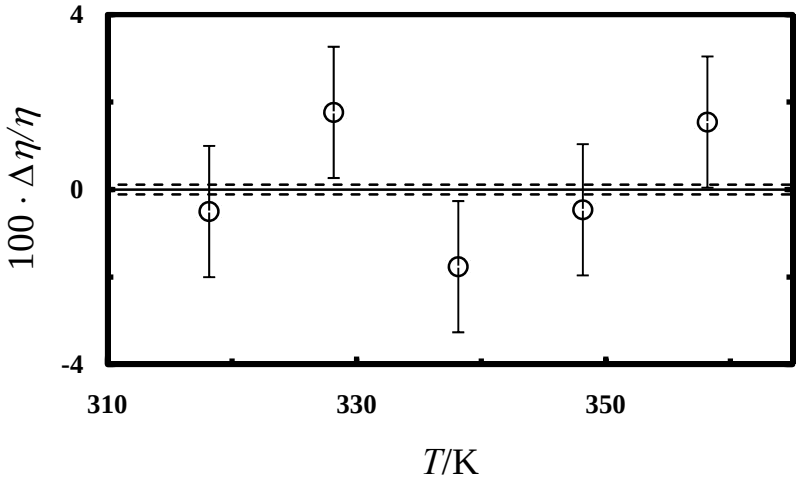

Figure S20.1 Relative deviations $\Delta\eta/\eta = (\eta - \eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid tris(2-hydroxyethyl)ammonium formate as a function of temperature *T*. The combined (k = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 0.1$ represent the standard deviation of the fit to its data.

Table S21 Conductivities κ of the ionic liquid tris(2-hydroxyethyl)ammonium formate at elevated temperatures T

Compound	Tris(2-hydroxyethyl)ammonium formate
CASRN	24794-58-9
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$60 \cdot 10^{-4}$
Water mass fraction w of sample after measurement	$91 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	Cota et al. *J. Phys. Chem. B* 2007, *111,* 12468-12477.
Comments on literature data	Atmosphere not specified, water content after measurement not specified, Jenway model 4150 conductivity meter.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i \qquad \text{where} \quad \kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$1.1 \cdot 10^{-3}$

T	κ	κ_{eval}	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	**S·m^{-1}**	**S·m^{-1}**	**$\kappa \cdot 10^{-2}$**	**S·m^{-1}**	**S·m^{-1}**	**S·m^{-1}**	**S·m^{-1}**
318.15	0.095	0.095	0.1	-8.2	29.1	-23.2	n.a.
328.15	0.157	0.158	-0.2	-8.2	28.2	-21.8	n.a.
338.15	0.246	0.245	0.2	-8.2	27.3	-20.6	n.a.
348.15	0.358	0.358	-0.1	-8.2	26.6	-19.4	n.a.

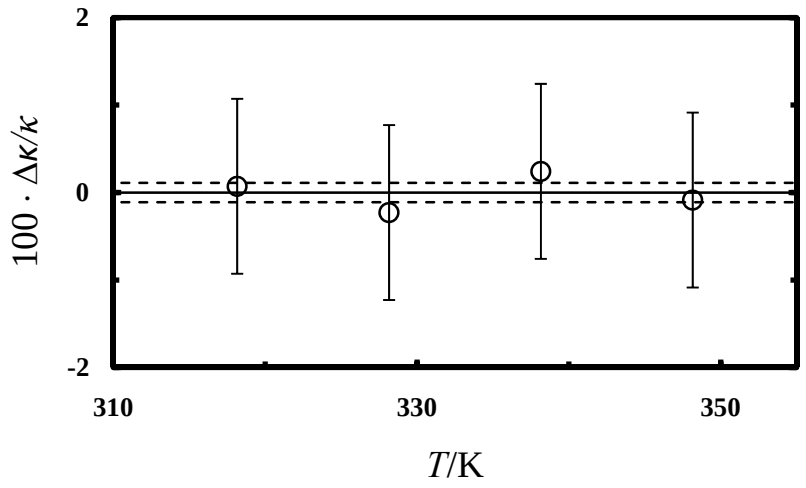

Figure S21.1 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid tris(2-hydroxyethyl)ammonium formate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.1$ represent the standard deviation of the fit to its data.

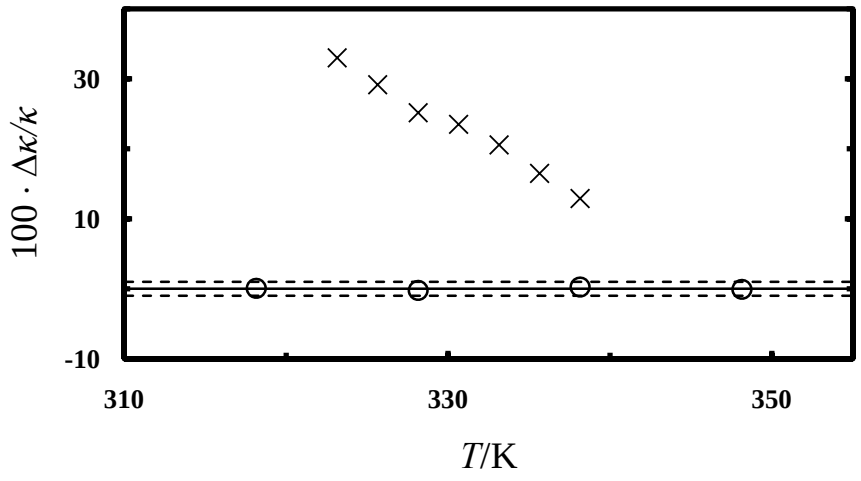

Figure S21.2 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid **t**ris(2-hydroxyethyl)ammonium formate as a function of temperature T. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 1.0$ represent the expanded uncertainty of the measurements. o this work; × Cota et al.

8) Tris(2-hydroxyethyl)ammonium acetate: [TEA]Ac

Table S22 Densities *ρ* of the ionic liquid tris(2-hydroxyethyl)ammonium acetate at elevated temperatures *T*

Compound	Tris(2-hydroxyethyl)ammonium acetate
CASRN	14806-72-5
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	$\pm$ 0.02 K
Water mass fraction *w* of sample before measurement	$66 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$101 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	Yuan et al. *J. Chem. Eng. Data* 2007, *52,* 596-599.
Comments on literature data	Water content after measurement not specified, pycnometer.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$1.3 \cdot 10^{-3}$

T	ρ	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	$\rho \cdot 10^{-2}$	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
308.15	1175.2	1175.4	0.0	1423.4	-248.0	n.a.	n.a.
318.15	1167.5	1167.4	0.0	1423.4	-256.0	n.a.	n.a.
328.15	1159.6	1159.3	0.0	1423.4	-264.1	n.a.	n.a.
338.15	1151.5	1151.3	0.0	1423.4	-272.1	n.a.	n.a.
348.15	1142.9	1143.2	0.0	1423.4	-280.2	n.a.	n.a.

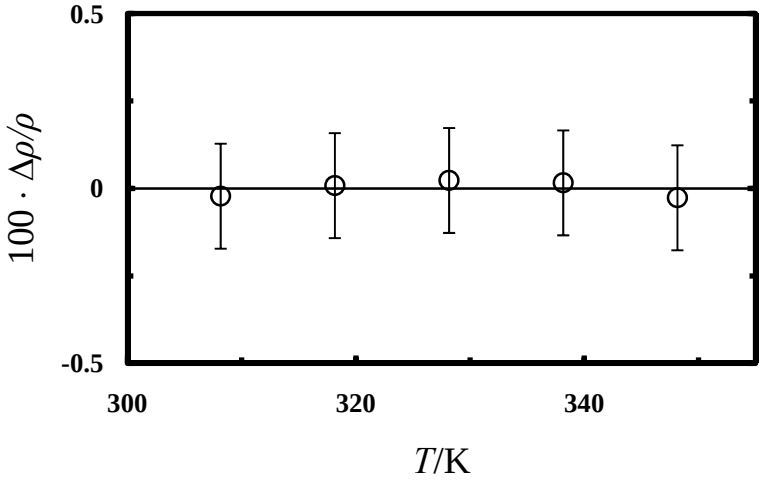

Figure S22.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid tris(2-hydroxyethyl)ammonium acetate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.1$.

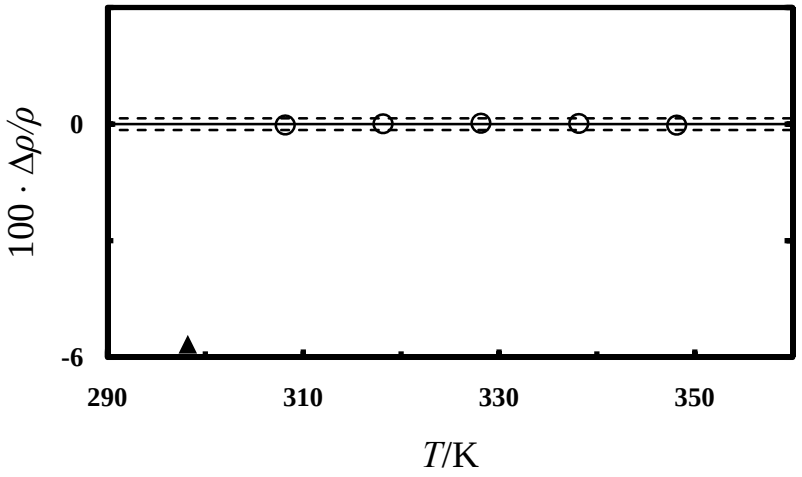

Figure S22.2 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid tris(2-hydroxyethyl)ammonium acetate as a function of temperature T. The dashed lines at $100\cdot\Delta\rho/\rho = \pm 0.15$ represent the expanded uncertainty of the measurements. o this work; ▲ Yuan et al.

Table S23 Viscosities η of the ionic liquid tris(2-hydroxyethyl)ammonium acetate at elevated temperatures *T*

Compound	Tris(2-hydroxyethyl)ammonium acetate
CASRN	14806-72-5
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$66 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$101 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	Yuan et al. *J. Chem. Eng. Data* 2007, *52,* 596-599.
Comments on literature data	Water content after measurement not specified, NDJ-1 rotary viscometer.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i \quad$ where $\quad \eta^0 = 1\ \mathrm{Pa{\cdot}s^{-1}}$
Standard deviation of fit function	$3.7 \cdot 10^{-3}$

T	η	η_{eval}	$(\eta-\eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
308.15	797	795	0.2	-108.5	370.1	-401.8	153.7
318.15	348	351	-0.9	-108.5	358.5	-376.9	139.7
328.15	179	177	0.9	-108.5	347.6	-354.3	127.3
338.15	97.9	97.7	0.2	-108.5	337.3	-333.7	116.3
348.15	56.9	57.3	-0.7	-108.5	327.6	-314.8	106.6
358.15	35.0	34.9	0.3	-108.5	318.5	-297.4	97.9

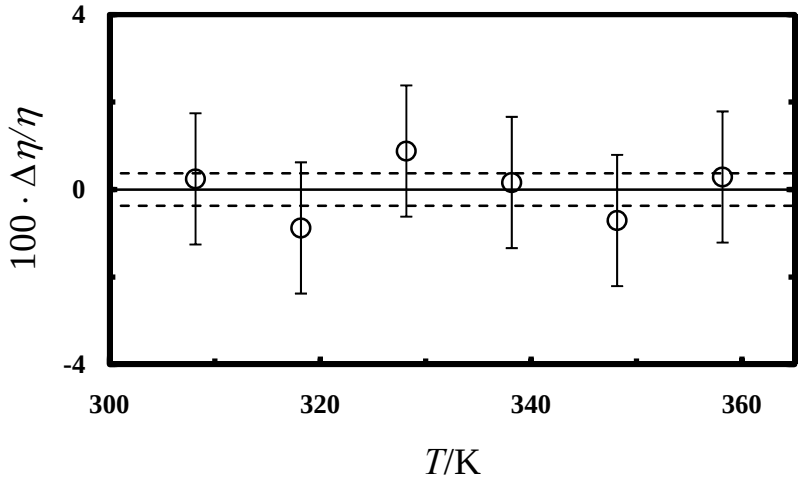

Figure S23.1 Relative deviations $\Delta\eta/\eta = (\eta-\eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid tris(2-hydroxyethyl)ammonium acetate as a function of temperature *T*. The combined (*k* = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.4$ represent the standard deviation of the fit to its data.

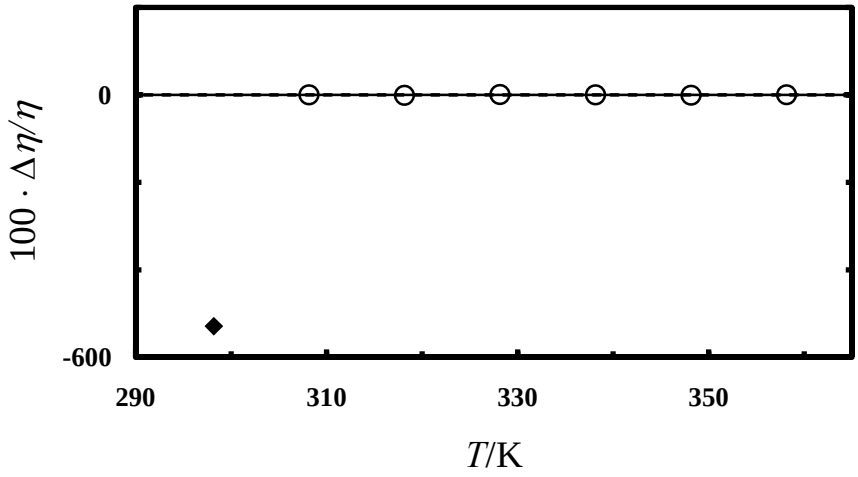

Figure S23.2 Relative deviations $\Delta\eta/\eta = (\eta-\eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid tris(2-hydroxyethyl)ammonium acetate as a function of temperature *T*. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 1.5$ represent the expanded uncertainty of the measurements. o this work; ▲ Yuan et al.

Table S24 Conductivities κ of the ionic liquid tris(2-hydroxyethyl)ammonium acetate at elevated temperatures T

Compound	Tris(2-hydroxyethyl)ammonium acetate
CASRN	14806-72-5
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	± 0.01 K
Water mass fraction w of sample before measurement	$66 \cdot 10^{-4}$
Water mass fraction w of sample after measurement	$101 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	Yuan et al. *J. Chem. Eng. Data* 2007, *52,* 596-599.
Comments on literature data	Water content after measurement not specified, DDS-307 conductivity meter.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$0.4 \cdot 10^{-3}$

T	κ	κ_{eval}	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$\kappa \cdot 10^{-2}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$
308.15	0.025	0.025	0.0	17.6	-52.4	63.4	-32.3
318.15	0.049	0.049	0.1	17.6	-50.8	59.5	-29.3
328.15	0.087	0.087	-0.1	17.6	-49.2	55.9	-26.7
338.15	0.144	0.144	0.1	17.6	-47.8	52.7	-24.4
348.15	0.222	0.222	0.0	17.6	-46.4	49.7	-22.4

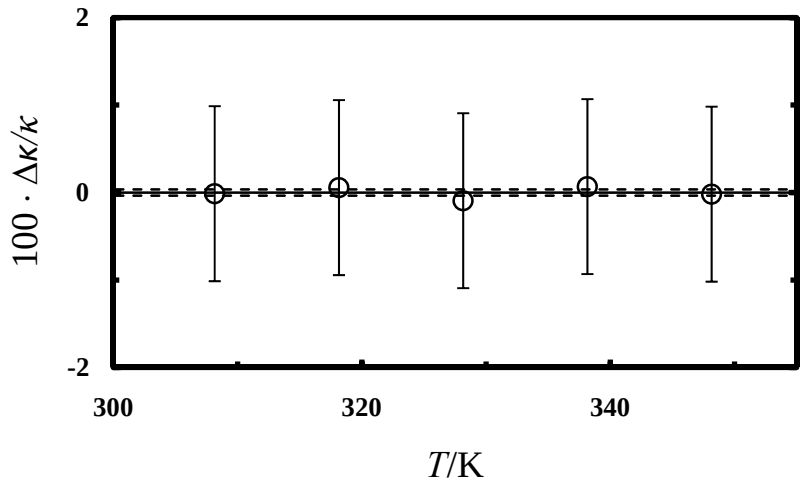

Figure S24.1 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid tris(2-hydroxyethyl)ammonium acetate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.4\cdot10^{-1}$ represent the standard deviation of the fit to its data.

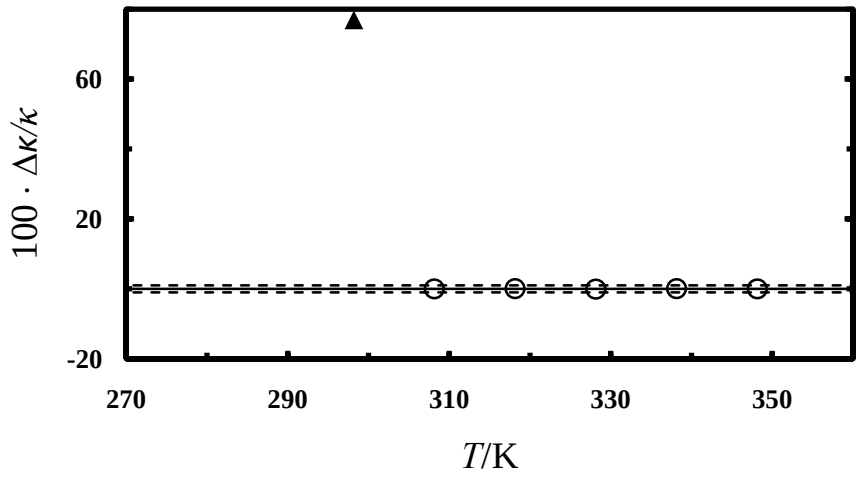

Figure S24.2 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid tris(2-hydroxyethyl)ammonium acetate as a function of temperature T. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 1.0$ represent the expanded uncertainty of the measurements. o this work; ▲ Yuan et al.

9) Tris(2-hydroxyethyl)ammonium malonate: [TEA]Mal

Table S25 Densities *ρ* of the ionic liquid tris(2-hydroxyethyl)ammonium malonate at elevated temperatures *T*

Compound	Tris(2-hydroxyethyl)ammonium malonate
CASRN	117225-80-6
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	$\pm$ 0.02 K
Water mass fraction *w* of sample before measurement	$34 \cdot 10^{-3}$
Water mass fraction *w* of sample after measurement	$52 \cdot 10^{-3}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$1.2 \cdot 10^{-4}$

T	***ρ***	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	**kg·m^{-3}**	**kg·m^{-3}**	**ρ ·10^{-2}**	**kg·m^{-3}**	**kg·m^{-3}**	**kg·m^{-3}**	**kg·m^{-3}**
278.15	1262.2	1262.5	0.0	1486.3	-223.8	n.a.	n.a.
288.15	1254.5	1254.5	0.0	1486.3	-231.8	n.a.	n.a.
298.15	1246.6	1246.4	0.0	1486.3	-239.9	n.a.	n.a.
308.15	1238.6	1238.4	0.0	1486.3	-247.9	n.a.	n.a.
318.15	1230.5	1230.3	0.0	1486.3	-256.0	n.a.	n.a.
328.15	1222.4	1222.3	0.0	1486.3	-264.0	n.a.	n.a.
338.15	1213.9	1214.2	0.0	1486.3	-272.0	n.a.	n.a.

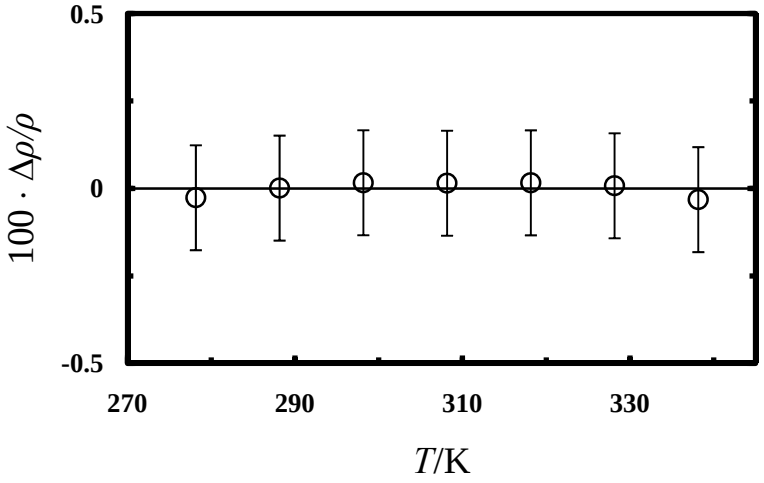

Figure S25.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid tris(2-hydroxyethyl)ammonium malonate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 1.2\cdot10^{-2}$.

Table S26 Viscosities η of the ionic liquid tris(2-hydroxyethyl)ammonium malonate at elevated temperatures *T*

Compound	Tris(2-hydroxyethyl)ammonium malonate
CASRN	117225-80-6
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$34 \cdot 10^{-3}$
Water mass fraction *w* of sample after measurement	$52 \cdot 10^{-3}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\eta^0 = 1$ Pa·s^{-1}
Standard deviation of fit function	$1.3 \cdot 10^{-2}$

T	η	η_{eval}	$(\eta - \eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
328.15	672	678	-0.9	66.3	-133.9	81.1	0.0
338.15	325	316	2.8	66.3	-130.0	76.3	0.0
348.15	170	176	-3.0	66.3	-126.2	72.0	0.0
358.15	114	113	1.0	66.3	-122.7	68.0	0.0

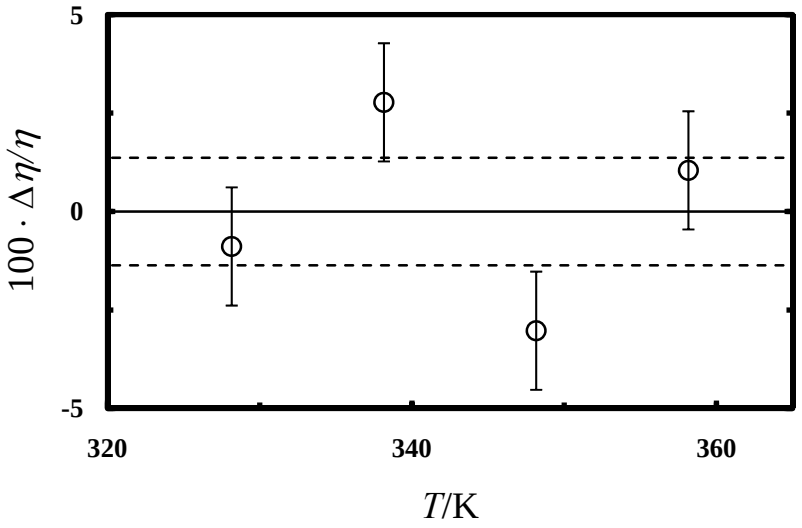

Figure S26.1 Relative deviations $\Delta\eta/\eta = (\eta - \eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid tris(2-hydroxyethyl)ammonium malonate as a function of temperature *T*. The combined (*k* = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 1.3$ represent the standard deviation of the fit to its data.

Table S27 Conductivities κ of the ionic liquid tris(2-hydroxyethyl)ammonium malonate at elevated temperatures T

Compound	Tris(2-hydroxyethyl)ammonium malonate
CASRN	117225-80-6
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$34 \cdot 10^{-3}$
Water mass fraction w of sample after measurement	$52 \cdot 10^{-3}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$6.6 \cdot 10^{-3}$

T / K	$\kappa \cdot 10$ / S·m^{-1}	$10 \cdot \kappa_{eval}$ / S·m^{-1}	$(\kappa - \kappa_{eval})$ / $\kappa \cdot 10^{-2}$	A_0 / S·m^{-1}	A_1 / S·m^{-1}	A_2 / S·m^{-1}	A_3 / S·m^{-1}
278.15	0.002	0.002	0.4	15.3	-48.3	64.2	-39.6
288.15	0.008	0.008	-0.7	15.3	-46.6	59.8	-35.6
298.15	0.024	0.024	-0.3	15.3	-45.1	55.9	-32.2
308.15	0.060	0.060	0.2	15.3	-43.6	52.3	-29.1
318.15	0.137	0.133	2.5	15.3	-42.2	49.1	-26.5
328.15	0.259	0.266	-2.8	15.3	-40.9	46.1	-24.1
338.15	0.487	0.485	0.4	15.3	-39.7	43.4	-22.1
348.15	0.826	0.823	0.3	15.3	-38.6	41.0	-20.2

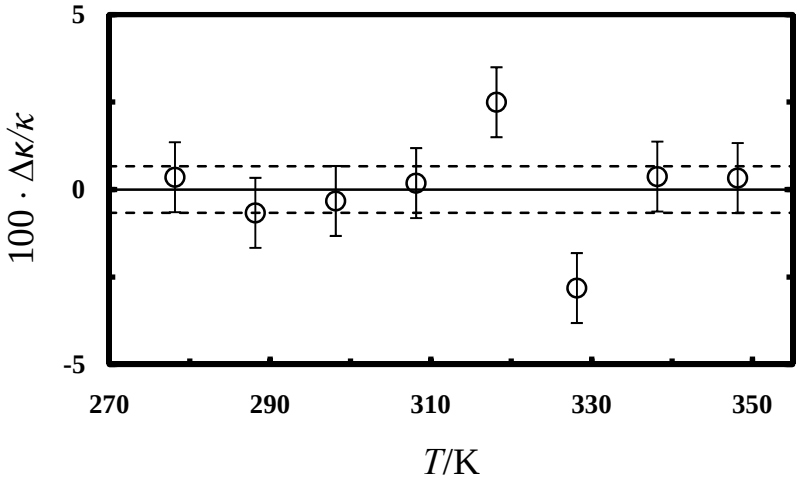

Figure S27.1 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid tris(2-hydroxyethyl)ammonium malonate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.6$ represent the standard deviation of the fit to its data.

10) 3-Hydroxypropylammonium formate: [HPA]Fmt

Table S28 Densities *ρ* of the ionic liquid 3-Hydroxypropylammonium formate at elevated temperatures *T*

Compound	3-Hydroxypropylammonium formate
CASRN	n.a.
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	$\pm$ 0.02 K
Water mass fraction *w* of sample before measurement	$66 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$86 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.2 \cdot 10^{-4}$

T	ρ	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	$\rho \cdot 10^{-2}$	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
278.15	1166.8	1166.8	0.0	1315.2	-148.4	n.a.	n.a.
288.15	1161.5	1161.5	0.0	1315.2	-153.7	n.a.	n.a.
298.15	1156.2	1156.2	0.0	1315.2	-159.1	n.a.	n.a.
308.15	1150.8	1150.8	0.0	1315.2	-164.4	n.a.	n.a.
318.15	1145.5	1145.5	0.0	1315.2	-169.7	n.a.	n.a.
328.15	1140.2	1140.2	0.0	1315.2	-175.1	n.a.	n.a.
338.15	1134.9	1134.8	0.0	1315.2	-180.4	n.a.	n.a.
348.15	1129.4	1129.5	0.0	1315.2	-185.7	n.a.	n.a.

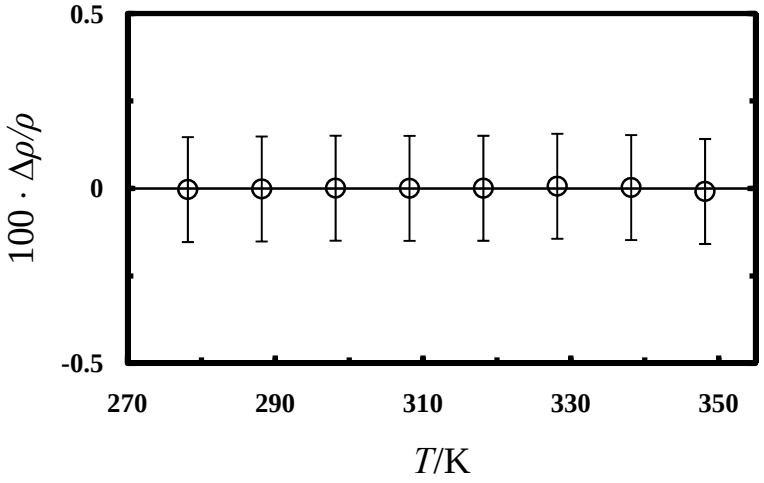

Figure S28.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid 3-hydroxypropylammonium formate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.2\cdot10^{-2}$.

Table S29 Viscosities η of the ionic liquid 3-Hydroxypropylammonium formate at elevated temperatures *T*

Compound	3-Hydroxypropylammonium formate
CASRN	n.a.
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$66 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$86 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i \quad$ where $\quad \eta^0 = 1\ \mathrm{Pa{\cdot}s^{-1}}$
Standard deviation of fit function	$1.2 \cdot 10^{-2}$

T	η	η_{eval}	$(\eta-\eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
288.15	594	600	-1.1	-84.3	332.0	-395.0	160.5
298.15	310	298	3.9	-84.3	320.9	-368.9	144.9
308.15	170	178	-4.6	-84.3	310.5	-345.4	131.2
318.15	123	122	0.9	-84.3	300.7	-324.0	119.2
328.15	91.8	90.9	0.9	-84.3	291.6	-304.5	108.7
338.15	72.0	71.8	0.2	-84.3	282.9	-286.8	99.3
348.15	58.4	58.6	-0.4	-84.3	274.8	-270.6	91.0

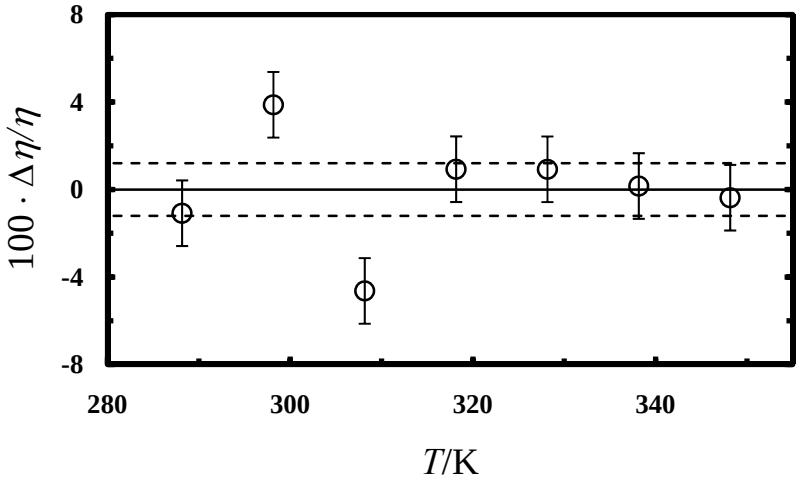

Figure S29.1 Relative deviations $\Delta\eta/\eta = (\eta - \eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid 3-hydroxypropylammonium formate as a function of temperature *T*. The combined (k = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 1.2$ represent the standard deviation of the fit to its data.

Table S30 Conductivities κ of the ionic liquid 3-Hydroxypropylammonium formate at elevated temperatures T

Compound	3-Hydroxypropylammonium formate
CASRN	n.a.
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$66 \cdot 10^{-4}$
Water mass fraction w of sample after measurement	$86 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i \quad \text{where} \quad \kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$3.2 \cdot 10^{-3}$

T	κ	κ_{eval}	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$\kappa \cdot 10^{-2}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$
278.15	0.044	0.043	0.3	32.2	-97.5	110.1	-48.0
288.15	0.087	0.087	-0.9	32.2	-94.1	102.6	-43.2
298.15	0.157	0.157	0.2	32.2	-90.9	95.9	-39.0
308.15	0.261	0.260	0.6	32.2	-88.0	89.7	-35.3
318.15	0.404	0.403	0.4	32.2	-85.2	84.2	-32.1
328.15	0.590	0.594	-0.6	32.2	-82.6	79.1	-29.2
338.15	0.840	0.843	-0.4	32.2	-80.2	74.5	-26.7
348.15	1.165	1.161	0.3	32.2	-77.9	70.3	-24.5

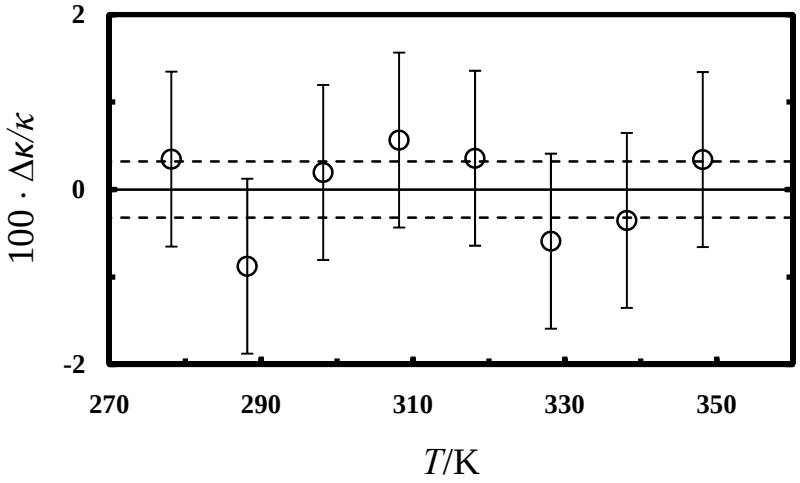

Figure S30.1 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid 3-hydroxypropylammonium formate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.3$ represent the standard deviation of the fit to its data.

11) 3-Hydroxypropylammonium acetate: [HPA]Ac

Table S31 Densities *ρ* of the ionic liquid 3-Hydroxypropylammonium acetate at elevated temperatures *T*

Compound	3-Hydroxypropylammonium acetate
CASRN	n.a.
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	± 0.02 K
Water mass fraction *w* of sample before measurement	$72 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$98 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.3 \cdot 10^{-4}$

T	***ρ***	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	**kg·m^{-3}**	**kg·m^{-3}**	**ρ ·10^{-2}**	**kg·m^{-3}**	**kg·m^{-3}**	**kg·m^{-3}**	**kg·m^{-3}**
278.15	1127.6	1127.6	0.0	1275.4	-147.8	n.a.	n.a.
288.15	1122.3	1122.3	0.0	1275.4	-153.1	n.a.	n.a.
298.15	1117.0	1117.0	0.0	1275.4	-158.4	n.a.	n.a.
308.15	1111.7	1111.7	0.0	1275.4	-163.7	n.a.	n.a.
318.15	1106.5	1106.4	0.0	1275.4	-169.0	n.a.	n.a.
328.15	1101.2	1101.1	0.0	1275.4	-174.3	n.a.	n.a.
338.15	1095.8	1095.8	0.0	1275.4	-179.7	n.a.	n.a.
348.15	1090.3	1090.5	0.0	1275.4	-185.0	n.a.	n.a.

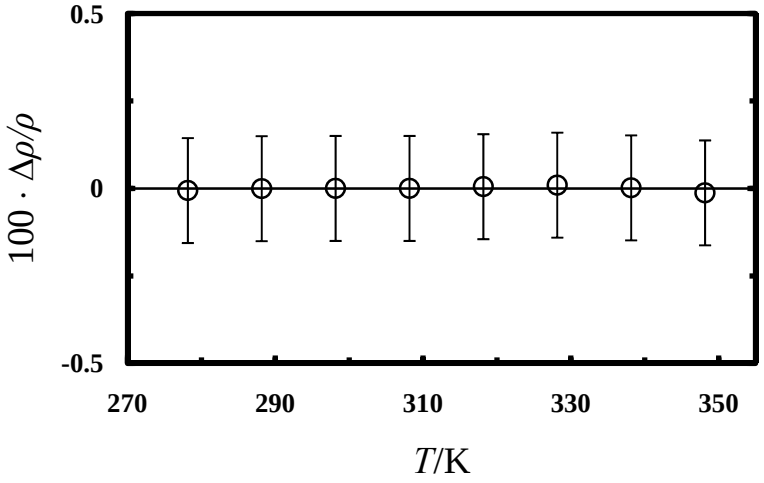

Figure S31.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid 3-hydroxypropylammonium acetate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.3\cdot10^{-2}$.

Table S32 Viscosities η of the ionic liquid 3-Hydroxypropylammonium acetate at elevated temperatures *T*

Compound	3-Hydroxypropylammonium acetate
CASRN	n.a.
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$72 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$98 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\eta^0 = 1$ Pa·s^{-1}
Standard deviation of fit function	$1.1 \cdot 10^{-3}$

T	η	η_{eval}	$(\eta - \eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
318.15	763	763	0.0	-19.7	76.7	-74.7	31.2
328.15	409	409	-0.2	-19.7	74.3	-70.2	28.4
338.15	235	234	0.3	-19.7	72.1	-66.1	26.0
348.15	141	141	-0.2	-19.7	70.1	-62.4	23.8
358.15	89.0	88.9	0.1	-19.7	68.1	-58.9	21.9

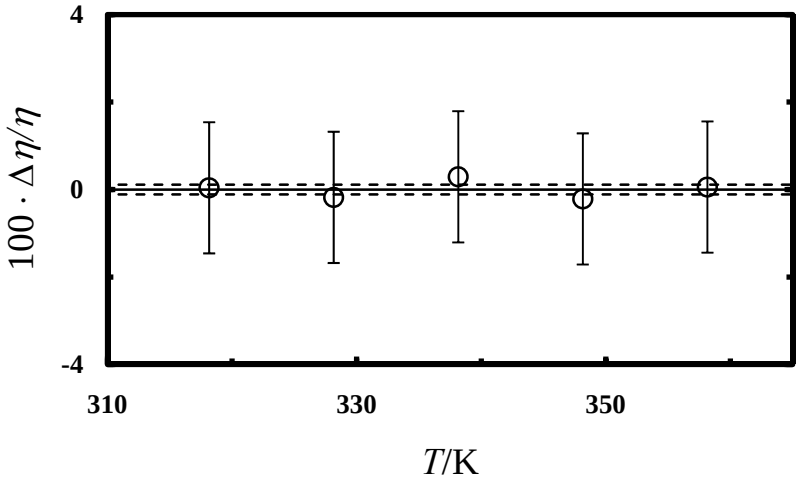

Figure S32.1 Relative deviations $\Delta\eta/\eta = (\eta - \eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid 3-hydroxypropylammonium acetate as a function of temperature *T*. The combined (k = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 0.1$ represent the standard deviation of the fit to its data.

Table S33 Conductivities κ of the ionic liquid 3-Hydroxypropylammonium acetate at elevated temperatures T

Compound	3-Hydroxypropylammonium acetate
CASRN	n.a.
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$72 \cdot 10^{-4}$
Water mass fraction w of sample after measurement	$98 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$0.3 \cdot 10^{-3}$

T	κ	κ_{eval}	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	S·m^{-1}	S·m^{-1}	$\kappa \cdot 10^{-2}$	S·m^{-1}	S·m^{-1}	S·m^{-1}	S·m^{-1}
278.15	0.002	0.002	0.0	12.0	-27.6	29.4	-20.0
288.15	0.005	0.005	-0.1	12.0	-26.7	27.4	-18.0
298.15	0.012	0.012	0.0	12.0	-25.8	25.6	-16.2
308.15	0.025	0.025	0.0	12.0	-24.9	24.0	-14.7
318.15	0.048	0.048	0.1	12.0	-24.1	22.5	-13.3
328.15	0.085	0.085	0.0	12.0	-23.4	21.1	-12.2
338.15	0.141	0.141	-0.1	12.0	-22.7	19.9	-11.1
348.15	0.222	0.222	0.0	12.0	-22.1	18.8	-10.2

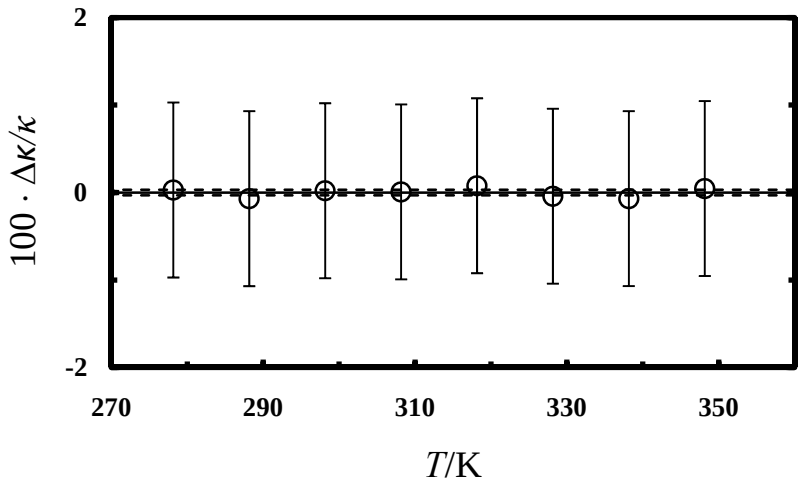

Figure S33.1 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid 3-hydroxypropylammonium acetate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.3\cdot10^{-1}$ represent the standard deviation of the fit to its data.

12) 3-Hydroxypropylammonium malonate: [HPA]Mal

Table S34 Densities *ρ* of the ionic liquid 3-Hydroxypropylammonium malonate at elevated temperatures *T*

Compound	3-Hydroxypropylammonium malonate
CASRN	n.a.
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	± 0.02 K
Water mass fraction *w* of sample before measurement	$64 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$94 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.1 \cdot 10^{-3}$

T	ρ	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	ρ ·10^{-2}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
278.15	1268.3	1268.4	0.0	1441.3	-173.0	n.a.	n.a.
288.15	1262.0	1262.1	0.0	1441.3	-179.2	n.a.	n.a.
298.15	1255.9	1255.9	0.0	1441.3	-185.4	n.a.	n.a.
308.15	1249.7	1249.7	0.0	1441.3	-191.6	n.a.	n.a.
318.15	1243.7	1243.5	0.0	1441.3	-197.8	n.a.	n.a.
328.15	1237.7	1237.3	0.0	1441.3	-204.1	n.a.	n.a.
338.15	1230.6	1231.1	0.0	1441.3	-210.3	n.a.	n.a.

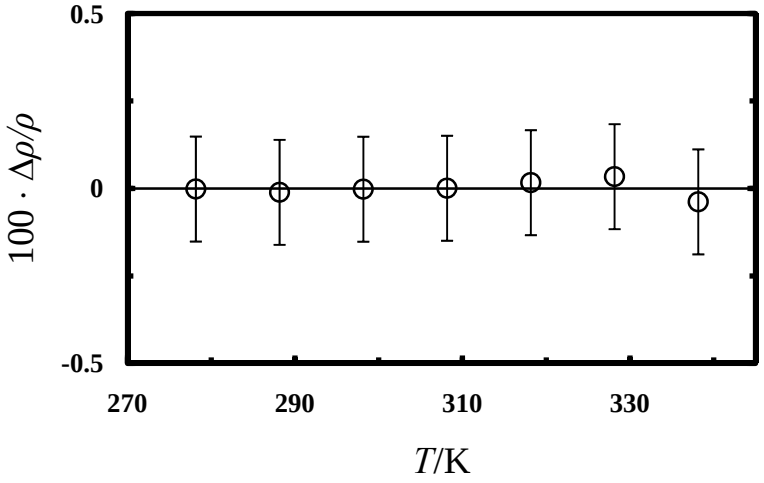

Figure S34.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid 3-hydroxypropylammonium malonate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.1\cdot10^{-1}$.

Table S35 Viscosities η of the ionic liquid 3-Hydroxypropylammonium malonate at elevated temperatures *T*

Compound	3-Hydroxypropylammonium malonate
CASRN	n.a.
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$64 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$94 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i \quad$ where $\quad \eta^0 = 1\ \mathrm{Pa{\cdot}s^{-1}}$
Standard deviation of fit function	n.a.

T	η	η_{eval}	$(\eta-\eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
348.15	833	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
358.15	694	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Table S36 Conductivities κ of the ionic liquid 3-Hydroxypropylammonium malonate at elevated temperatures T

Compound	3-Hydroxypropylammonium malonate
CASRN	n.a.
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$64 \cdot 10^{-4}$
Water mass fraction w of sample after measurement	$94 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$1.7 \cdot 10^{-3}$

T	$\kappa \cdot 10$	$10 \cdot \kappa_{eval}$	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$\kappa \cdot 10^{-2}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$
278.15	0.002	0.002	0.0	27.5	-86.5	103.4	-52.8
288.15	0.008	0.008	-0.1	27.5	-83.5	96.3	-47.5
298.15	0.022	0.022	0.4	27.5	-80.7	90.0	-42.8
308.15	0.055	0.055	-0.5	27.5	-78.1	84.2	-38.8
318.15	0.122	0.122	-0.1	27.5	-75.6	79.0	-35.3
328.15	0.244	0.243	0.4	27.5	-73.3	74.3	-32.1
338.15	0.446	0.447	-0.2	27.5	-71.2	69.9	-29.4

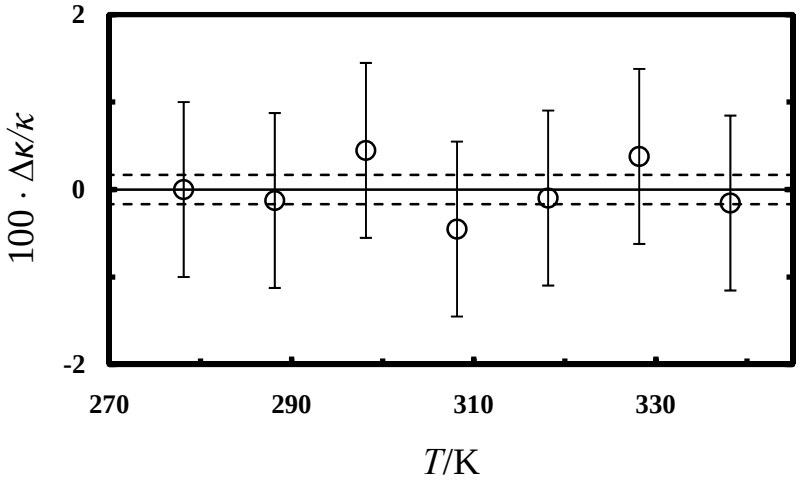

Figure S36.1 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid 3-hydroxypropylammonium malonate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.2$ represent the standard deviation of the fit to its data.

13) Diallylammonium formate: [DAA]Fmt

Table S37 Densities *ρ* of the ionic liquid diallylammonium formate at elevated temperatures *T*

Compound	Diallylammonium formate
CASRN	n.a.
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	$\pm$ 0.02 K
Water mass fraction *w* of sample before measurement	$69 \cdot 10^{-5}$
Water mass fraction *w* of sample after measurement	$209 \cdot 10^{-5}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.4 \cdot 10^{-4}$

T	ρ	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	$\rho \cdot 10^{-2}$	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
278.15	952.1	952.1	0.0	1186.6	-234.5	n.a.	n.a.
288.15	943.7	943.7	0.0	1186.6	-242.9	n.a.	n.a.
298.15	935.4	935.3	0.0	1186.6	-251.3	n.a.	n.a.
308.15	926.8	926.9	0.0	1186.6	-259.7	n.a.	n.a.
318.15	918.5	918.4	0.0	1186.6	-268.2	n.a.	n.a.
328.15	910.1	910.0	0.0	1186.6	-276.6	n.a.	n.a.
338.15	901.5	901.6	0.0	1186.6	-285.0	n.a.	n.a.

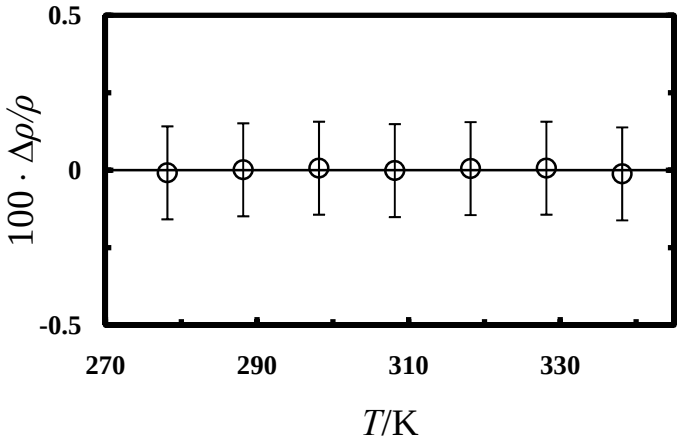

Figure S37.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid diallylammonium formate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.2\cdot10^{-2}$.

Table S38 Viscosities η of the ionic liquid diallylammonium formate at elevated temperatures *T*

Compound	Diallylammonium formate
CASRN	n.a.
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$69 \cdot 10^{-5}$
Water mass fraction *w* of sample after measurement	$209 \cdot 10^{-5}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i \quad$ where $\quad \eta^0 = 1\ \mathrm{Pa{\cdot}s^{-1}}$
Standard deviation of fit function	$0.9 \cdot 10^{-3}$

T	η	η_{eval}	$(\eta-\eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
288.15	3.29	3.29	0.1	-11.8	54.1	-57.1	23.0
298.15	2.45	2.46	-0.4	-11.8	52.2	-53.3	20.7
308.15	1.92	1.92	0.2	-11.8	50.5	-49.7	18.6
318.15	1.54	1.54	0.2	-11.8	48.9	-46.6	16.9
328.15	1.26	1.26	-0.1	-11.8	47.3	-43.7	15.3
338.15	1.05	1.05	-0.2	-11.8	45.9	-41.1	14.0

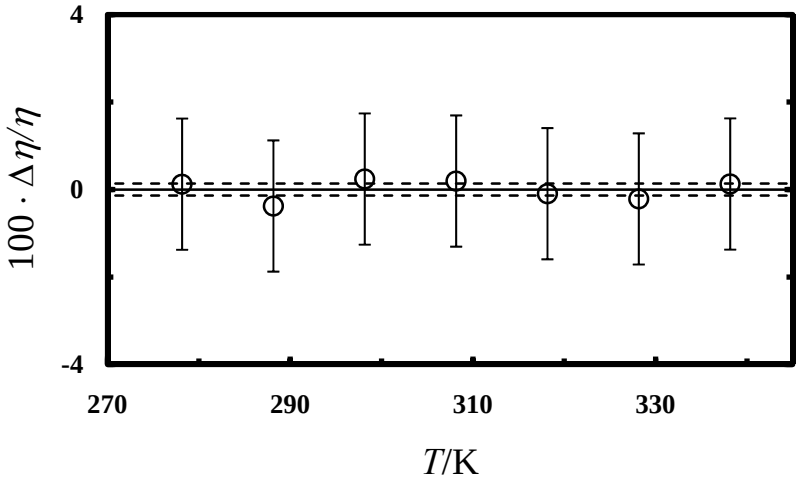

Figure S38.1 Relative deviations $\Delta\eta/\eta = (\eta - \eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid diallylammonium formate as a function of temperature *T*. The combined (k = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 0.9 \cdot 10^{-1}$ represent the standard deviation of the fit to its data.

Table S39 Conductivities κ of the ionic liquid diallylammonium formate at elevated temperatures T

Compound	Diallylammonium formate
CASRN	n.a.
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$69 \cdot 10^{-5}$
Water mass fraction w of sample after measurement	$209 \cdot 10^{-5}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$0.2 \cdot 10^{-3}$

T	$10 \cdot \kappa$	$10 \cdot \kappa_{eval}$	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$\kappa \cdot 10^{-2}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$	$S \cdot m^{-1}$
278.15	0.004	0.004	-0.1	-20.2	50.4	-57.4	19.3
288.15	0.005	0.005	0.3	-20.2	48.7	-53.5	17.4
298.15	0.006	0.006	-0.4	-20.2	47.0	-49.9	15.7
308.15	0.007	0.007	0.4	-20.2	45.5	-46.7	14.2
318.15	0.008	0.008	-0.2	-20.2	44.1	-43.9	12.9
328.15	0.010	0.010	0.1	-20.2	42.7	-41.2	11.8
338.15	0.011	0.011	0.0	-20.2	41.5	-38.8	10.8

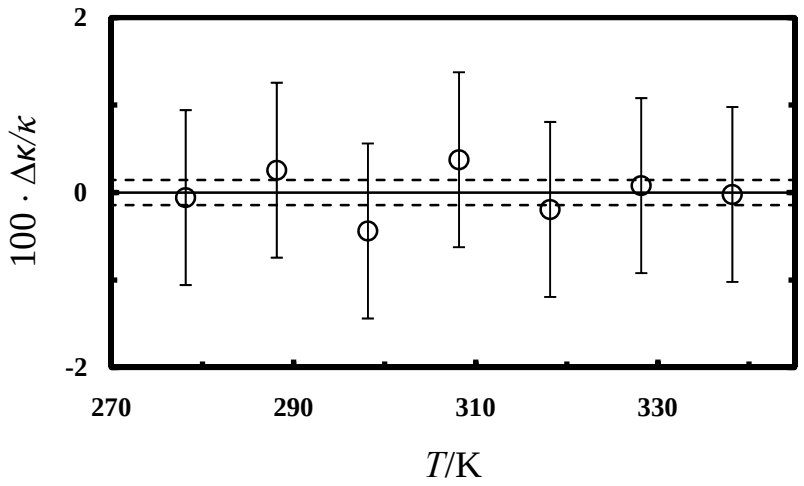

Figure S39.1 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid diallylammonium formate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.2\cdot10^{-1}$ represent the standard deviation of the fit to its data.

14) Diallylammonium acetate: [HPA]Ac

Table S40 Densities *ρ* of the ionic liquid diallylammonium acetate at elevated temperatures *T*

Compound	Diallylammonium acetate
CASRN	n.a.
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	$\pm$ 0.02 K
Water mass fraction *w* of sample before measurement	$68 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$435 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.2 \cdot 10^{-3}$

T	ρ	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	$\rho \cdot 10^{-2}$	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
278.15	995.2	986.9	-0.1	1241.4	-245.7	n.a.	n.a.
288.15	987.0	978.1	0.0	1241.4	-254.5	n.a.	n.a.
298.15	978.4	969.3	0.0	1241.4	-263.3	n.a.	n.a.
308.15	969.6	960.4	0.0	1241.4	-272.1	n.a.	n.a.
318.15	960.8	951.6	0.0	1241.4	-281.0	n.a.	n.a.
328.15	951.6	942.8	0.0	1241.4	-289.8	n.a.	n.a.
338.15	942.2	986.9	-0.1	1241.4	-298.6	n.a.	n.a.

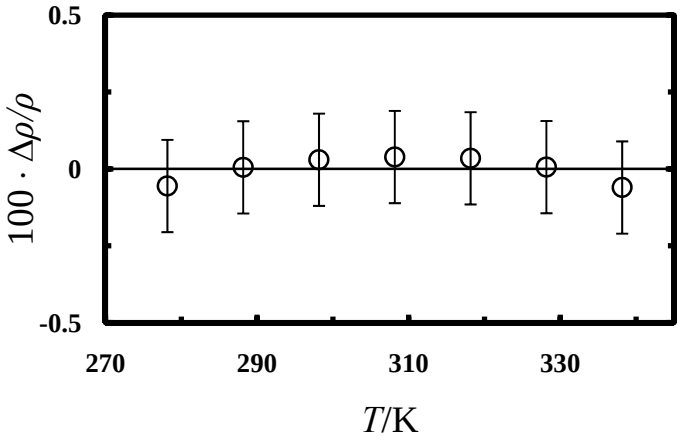

Figure S40.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid diallylammonium acetate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.2\cdot10^{-1}$.

Table S41 Viscosities η of the ionic liquid diallylammonium acetate at elevated temperatures *T*

Compound	Diallylammonium acetate
CASRN	n.a.
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$68 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$435 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\eta^0 = 1\ \mathrm{Pa{\cdot}s^{-1}}$
Standard deviation of fit function	$1.6 \cdot 10^{-3}$

T	η	η_{eval}	$(\eta - \eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
288.15	156.3	156.2	0.1	-54.4	191.9	-205.0	79.5
298.15	80.0	80.2	-0.3	-54.4	185.2	-191.0	71.5
308.15	45.7	45.5	0.4	-54.4	179.0	-178.4	64.5
318.15	27.6	27.7	-0.3	-54.4	173.2	-167.0	58.4

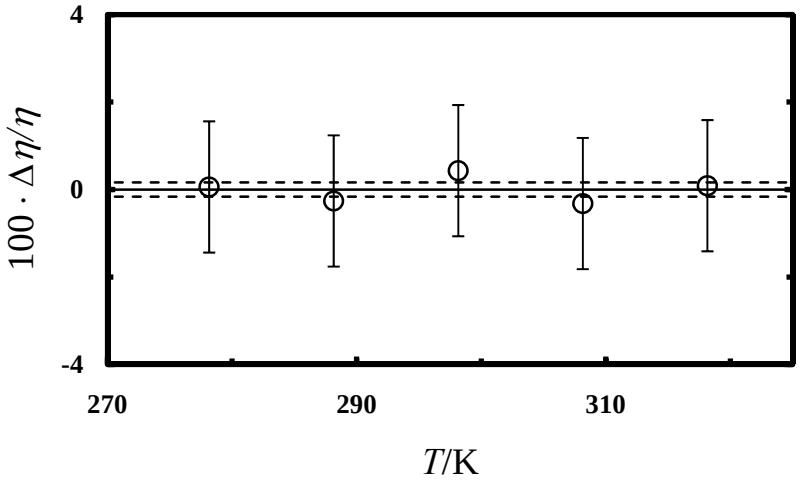

Figure S41.1 Relative deviations $\Delta\eta/\eta = (\eta - \eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid diallylammonium acetate as a function of temperature *T*. The combined ($k = 2$) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 0.2$ represent the standard deviation of the fit to its data.

Table S42 Conductivities κ of the ionic liquid diallylammonium acetate at elevated temperatures T

Compound	Diallylammonium acetate
CASRN	n.a.
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$68 \cdot 10^{-4}$
Water mass fraction w of sample after measurement	$435 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\kappa^0 = 1\ \mathrm{S{\cdot}m^{-1}}$
Standard deviation of fit function	$1.8 \cdot 10^{-4}$

T	κ	κ_{eval}	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	S·m^{-1}	S·m^{-1}	$\kappa \cdot 10^{-2}$	S·m^{-1}	S·m^{-1}	S·m^{-1}	S·m^{-1}
278.15	0.051	0.089	0.0	2.8	-4.7	8.9	-10.0
288.15	0.089	0.144	0.0	2.8	-4.5	8.3	-9.0
298.15	0.144	0.216	0.0	2.8	-4.4	7.8	-8.1
308.15	0.216	0.308	0.0	2.8	-4.2	7.3	-7.3
318.15	0.307	0.417	-0.1	2.8	-4.1	6.8	-6.7
328.15	0.418	0.545	0.1	2.8	-4.0	6.4	-6.1
338.15	0.545	0.089	0.0	2.8	-3.9	6.0	-5.5

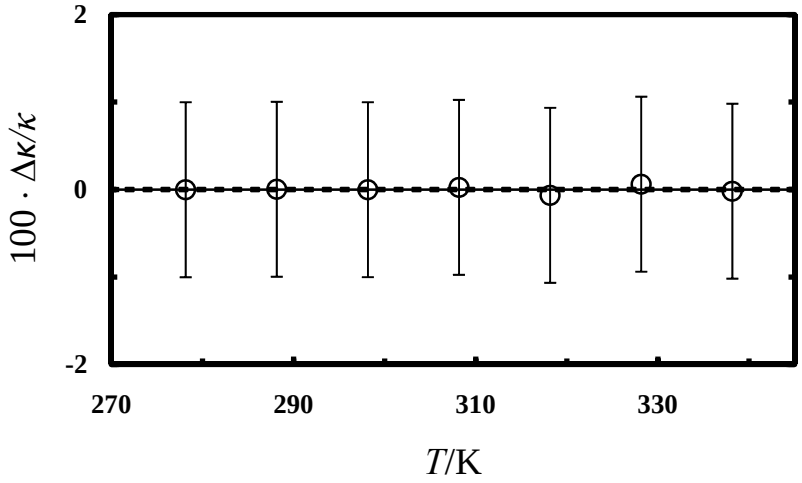

Figure S42.1 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid diallylammonium acetate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 1.8\cdot10^{-2}$ represent the standard deviation of the fit to its data.

15) Diallylammonium malonate: [HPA]Mal

Table S43 Densities *ρ* of the ionic liquid diallylammonium malonate at elevated temperatures *T*

Compound	Diallylammonium malonate
CASRN	n.a.
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	$\pm$ 0.02 K
Water mass fraction *w* of sample before measurement	$9.5 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$55.2 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.3 \cdot 10^{-3}$

T	ρ	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	$\rho \cdot 10^{-2}$	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
318.15	1084.5	1084.9	0.0	1351.7	-266.8	n.a.	n.a.
328.15	1077.2	1076.5	0.1	1351.7	-275.2	n.a.	n.a.
338.15	1067.8	1068.1	0.0	1351.7	-283.6	n.a.	n.a.

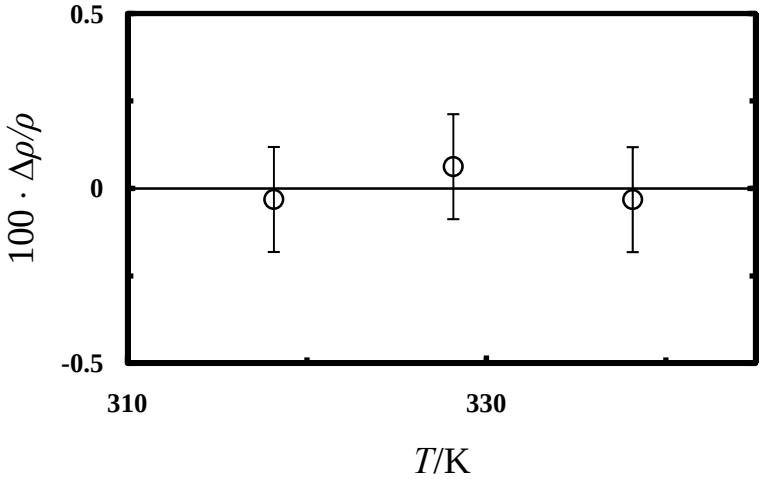

Figure S43.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid diallylammonium malonate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.3\cdot10^{-1}$.

Table S44 Viscosities η of the ionic liquid diallylammonium malonate at elevated temperatures *T*

Compound	Diallylammonium malonate
CASRN	n.a.
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$9.5 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$55.2 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i \quad$ where $\quad \eta^0 = 1\ \mathrm{Pa{\cdot}s^{-1}}$
Standard deviation of fit function	$3.5 \cdot 10^{-3}$

T	η	η_{eval}	$(\eta - \eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
318.15	211.5	211.8	-0.1	-14.1	56.6	-52.7	22.5
328.15	122.6	121.9	0.6	-14.1	54.9	-49.6	20.5
338.15	73.4	74.1	-0.9	-14.1	53.2	-46.7	18.7
348.15	47.4	47.1	0.7	-14.1	51.7	-44.0	17.1
358.15	31.0	31.1	-0.2	-14.1	50.3	-41.6	15.8

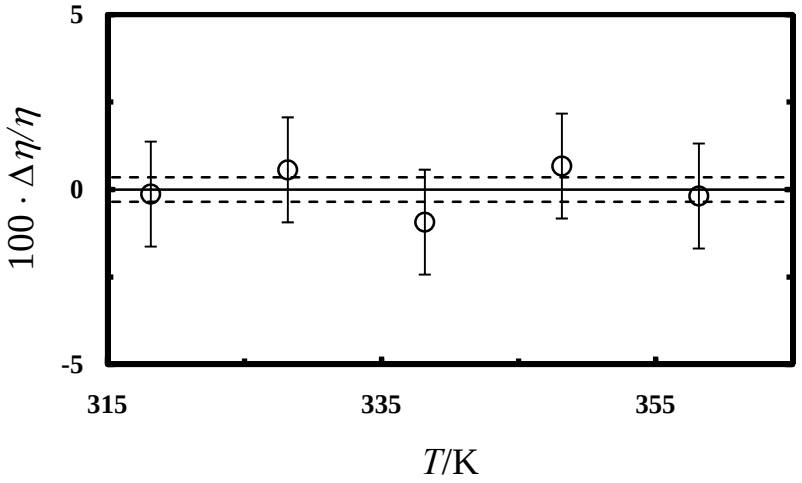

Figure S44.1 Relative deviations $\Delta\eta/\eta = (\eta - \eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid diallylammonium malonate as a function of temperature *T*. The combined (k = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 0.4$ represent the standard deviation of the fit to its data.

Table S45 Conductivities κ of the ionic liquid diallylammonium malonate at elevated temperatures T

Compound	Diallylammonium malonate
CASRN	n.a.
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$9.5 \cdot 10^{-4}$
Water mass fraction w of sample after measurement	$55.2 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i \quad$ where $\kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$5.4 \cdot 10^{-3}$

T	κ	κ_{eval}	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	S·m^{-1}	S·m^{-1}	$\kappa \cdot 10^{-2}$	S·m^{-1}	S·m^{-1}	S·m^{-1}	S·m^{-1}
278.15	0.002	0.002	0.4	102.6	-339.0	384.7	-154.4
288.15	0.007	0.007	-1.3	102.6	-327.2	358.4	-138.8
298.15	0.016	0.016	0.7	102.6	-316.2	334.8	-125.3
308.15	0.032	0.032	1.2	102.6	-306.0	313.4	-113.5
318.15	0.057	0.058	-0.9	102.6	-296.3	294.0	-103.1
328.15	0.098	0.098	-0.5	102.6	-287.3	276.4	-94.0
338.15	0.161	0.160	0.4	102.6	-278.8	260.3	-85.9

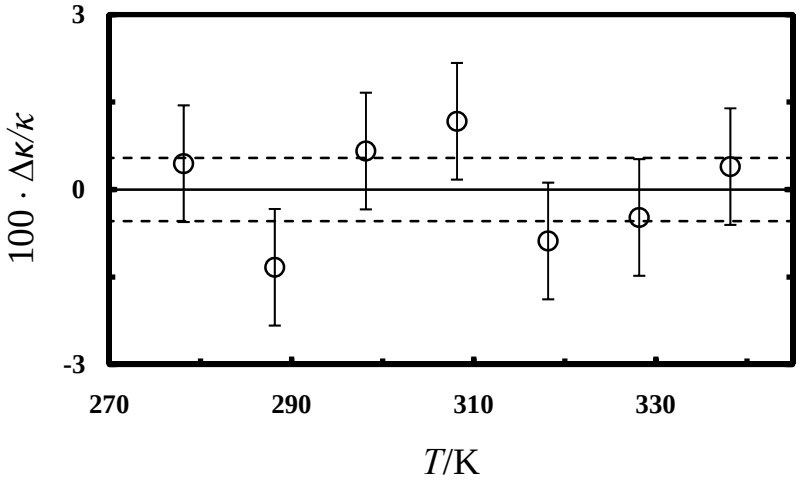

Figure S45.1 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid diallylammonium malonate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm$ 0.5 represent the standard deviation of the fit to its data.

16) 1-Ethyl-3-methylimidazolium acetate: [EMIM]Ac

Table S46 Densities *ρ* of the ionic liquid 1-ethyl-3-methylimidazolium acetate at elevated temperatures *T*

Compound	1-Ethyl-3-methylimidazolium acetate
CASRN	143314-17-4
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	± 0.02 K
Water mass fraction *w* of sample before measurement	$8 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$66 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Troshenkova et al. *Russ. J. Gen. Chem.* 2010, *80,* 501-506. b) Yokozeki et al. *J. Phys. Chem B.* 2008, *112,* 16654-16663.
Comments on literature data	a) No information about instruments or sample given. Value from MSDS? b) Water content after measurement not specified, pycnometer.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.8 \cdot 10^{-4}$

T	*ρ*	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	ρ ·10^{-2}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
278.15	1121.2	1121.0	0.0	1290.8	-169.7	n.a.	n.a.
288.15	1115.0	1114.9	0.0	1290.8	-175.8	n.a.	n.a.
298.15	1108.8	1108.8	0.0	1290.8	-181.9	n.a.	n.a.
308.15	1102.5	1102.7	0.0	1290.8	-188.0	n.a.	n.a.
318.15	1096.5	1096.6	0.0	1290.8	-194.1	n.a.	n.a.
328.15	1090.4	1090.5	0.0	1290.8	-200.2	n.a.	n.a.
338.15	1084.4	1084.4	0.0	1290.8	-206.3	n.a.	n.a.
348.15	1078.4	1078.3	0.0	1290.8	-212.4	n.a.	n.a.
358.15	1072.4	1072.2	0.0	1290.8	-218.5	n.a.	n.a.

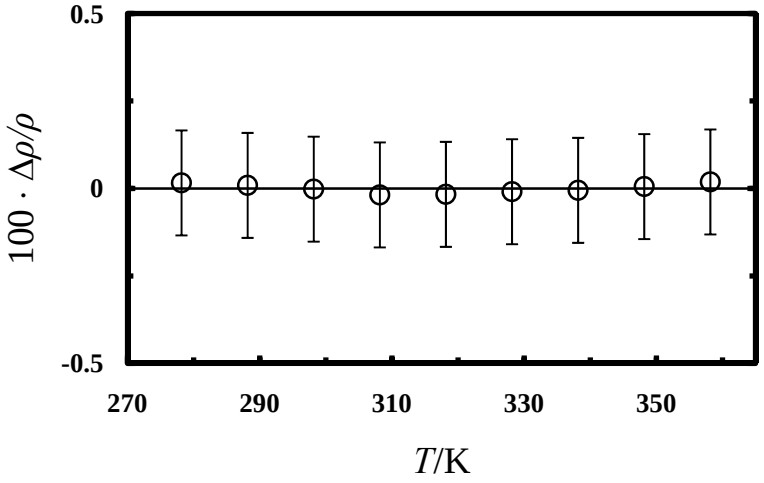

Figure S46.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid 1-ethyl-3-methylimidazolium acetate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.8\cdot10^{-2}$.

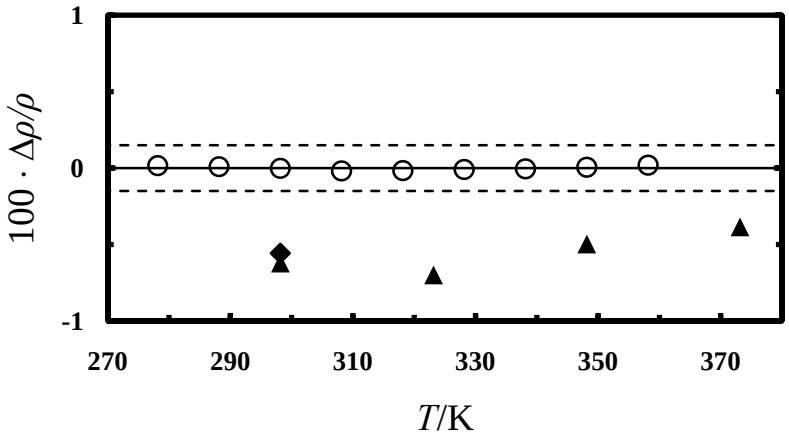

Figure S46.2 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid 1-ethyl-3-methylimidazolium acetate as a function of temperature T. The dashed lines at $100\cdot\Delta\rho/\rho = \pm 0.15$ represent the expanded uncertainty of the measurements. o this work; ▲ Yokozeki et al; ♦ Troshenkova et al.

Table S47 Viscosities η of the ionic liquid 1-ethyl-3-methylimidazolium acetate at elevated temperatures *T*

Compound	1-Ethyl-3-methylimidazolium acetate
CASRN	143314-17-4
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$8 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$66 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\eta^0 = 1$ Pa·s^{-1}
Standard deviation of fit function	$1.2 \cdot 10^{-2}$

T	η	η_{eval}	$(\eta - \eta_{eval})$	A_0	A_1	A_2	A_3
K	mPa·s^{-1}	mPa·s^{-1}	$\eta \cdot 10^{-2}$	Pa·s^{-1}	Pa·s^{-1}	Pa·s^{-1}	Pa·s^{-1}
278.15	380	386	-1.6	120.8	-397.1	455.5	-166.4
288.15	228	221	3.2	120.8	-383.3	424.5	-149.7
298.15	124	124	0.6	120.8	-370.5	396.5	-135.1
308.15	68.7	70.5	-2.7	120.8	-358.5	371.1	-122.4
318.15	41.4	42.0	-1.4	120.8	-347.2	348.2	-111.2
328.15	26.5	26.5	-0.1	120.8	-336.6	327.3	-101.3
338.15	18.3	17.9	1.9	120.8	-326.7	308.2	-92.6
348.15	13.3	13.1	1.7	120.8	-317.3	290.8	-84.8
358.15	10.1	10.3	-1.7	120.8	-308.4	274.7	-77.9

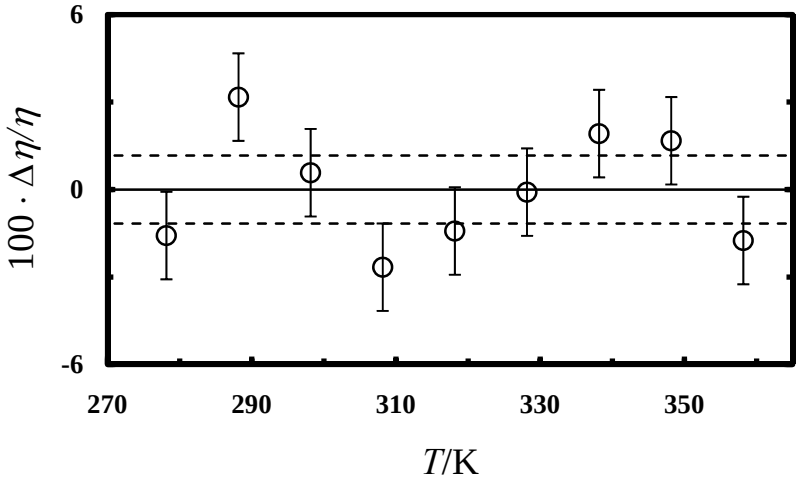

Figure S47.1 Relative deviations $\Delta\eta/\eta = (\eta - \eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid 1-ethyl-3-methylimidazolium acetate as a function of temperature *T*. The combined (k = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100 \cdot \Delta\eta/\eta = \pm 1.2$ represent the standard deviation of the fit to its data.

Table S48 Conductivities κ of the ionic liquid 1-ethyl-3-methylimidazolium acetate at elevated temperatures T

Compound	1-Ethyl-3-methylimidazolium acetate
CASRN	143314-17-4
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$8 \cdot 10^{-4}$
Water mass fraction w of sample after measurement	$66 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$0.1 \cdot 10^{-2}$

T	κ	κ_{eval}	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	S·m^{-1}	S·m^{-1}	$\kappa \cdot 10^{-2}$	S·m^{-1}	S·m^{-1}	S·m^{-1}	S·m^{-1}
278.15	0.104	0.104	-0.1	16.2	-51.2	68.9	-36.1
288.15	0.212	0.212	0.2	16.2	-49.4	64.2	-32.5
298.15	0.381	0.381	0.1	16.2	-47.8	59.9	-29.3
308.15	0.618	0.619	-0.2	16.2	-46.2	56.1	-26.6
318.15	0.928	0.930	-0.2	16.2	-44.8	52.6	-24.1
328.15	1.311	1.312	0.0	16.2	-43.4	49.5	-22.0
338.15	1.761	1.760	0.1	16.2	-42.1	46.6	-20.1
348.15	2.275	2.269	0.3	16.2	-40.9	43.9	-18.4
358.15	2.826	2.832	-0.2	16.2	-39.8	41.5	-16.9

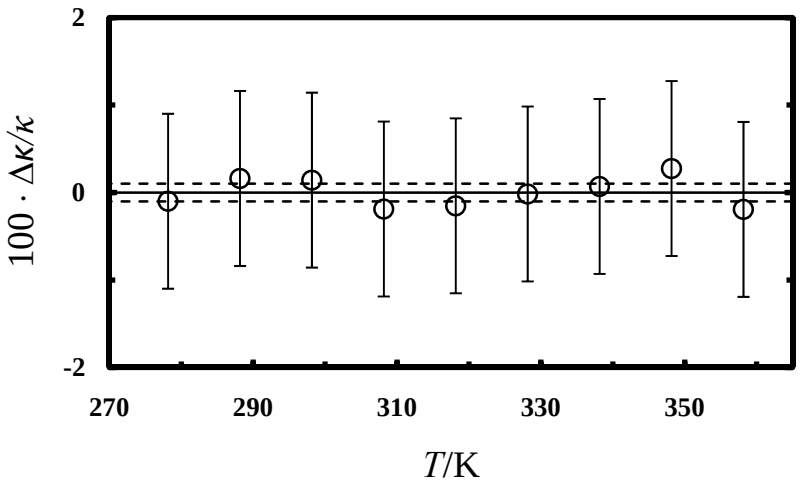

Figure S48.1 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid 1-ethyl-3-methylimidazolium acetate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.1$ represent the standard deviation of the fit to its data.

17) 1-Butyl-3-methylimidazolium acetate: [BMIM]Ac

Table S49 Densities *ρ* of the ionic liquid 1-butyl-3-methylimidazolium acetate at elevated temperatures *T*

Compound	1-Butyl-3-methylimidazolium acetate
CASRN	284049-75-8
Purity	single phase
Physical property	density
Combined expanded (*k* = 2) relative uncertainty	0.3 %
Instrument	Anton Paar DMA 602 H vibrating tube densimeter
Standards for calibration	Millipore water, ambient air with known humidity
Temperature range of calibration	(278.15 to 358.15) K
Thermocouples used	industrial grade platinum resistance thermometer of nominal resistance 100 Ω
Calibration of thermocouples	calibrated to a standard platinum thermometer of nominal resistance 25 Ω, which has been calibrated to ITS-90
Uncertainty of temperature *T*	$\pm$ 0.02 K
Water mass fraction *w* of sample before measurement	$36 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$90 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) Yokozeki et al. *J. Phys. Chem B.* 2008, *112,* 16654-16663. b) Tariq et al. *J. Chem. Thermodynamics* 2009, *41*, 790-798. c) Shifflet et al. *J. Chem. Eng. Data* 2006, *51*, 483-495. d) McHale et al. *Anal. Chem.* 2008, *80*, 5806-5811. e) Bogolitsyn et al. *Russ. J. Gen. Chem.* 2009, *79*, 125-128.
Comments on literature data	a) Water content after measurement not specified, pycnometer. b) Water content after measurement not specified, atmosphere not specified, DMA 5000 calibrated with air and bi-distilled water. c) Water content after measurement not specified, atmosphere not specified, measured at four temperatures (283.15, 298.15, 323.15, oscillating u-tube density meter (Microdensity meter, model 102B) verified at 298.15 K using a helium pycnometer (Micromeritics AccuPyc 1330 with a 1 cm^3 measuring cup). d) Water content after measurement not specified, atmosphere not specified, DMA 4500 density/specific gravity/concentration meter. e) Water content after measurement not specified, pycnometer.
Fit function for comparison with literature	$\rho_{eval} = \sum_{i=0}^{1} A_i (T/\mathrm{K})^i$
Standard deviation of fit function	$0.8 \cdot 10^{-4}$

Table S49 continued…

T	ρ	ρ_{eval}	$(\rho-\rho_{eval})$	A_0	A_1	A_2	A_3
K	kg·m^{-3}	kg·m^{-3}	$\rho \cdot 10^{-2}$	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}	kg·m^{-3}
278.15	1068.3	1068.1	0.0	1236.6	-168.5	n.a.	n.a.
288.15	1062.0	1062.0	0.0	1236.6	-174.6	n.a.	n.a.
298.15	1055.9	1056.0	0.0	1236.6	-180.7	n.a.	n.a.
308.15	1049.8	1049.9	0.0	1236.6	-186.7	n.a.	n.a.
318.15	1043.6	1043.8	0.0	1236.6	-192.8	n.a.	n.a.
328.15	1037.7	1037.8	0.0	1236.6	-198.8	n.a.	n.a.
338.15	1031.7	1031.7	0.0	1236.6	-204.9	n.a.	n.a.
348.15	1025.7	1025.7	0.0	1236.6	-210.9	n.a.	n.a.
358.15	1019.8	1019.6	0.0	1236.6	-217.0	n.a.	n.a.

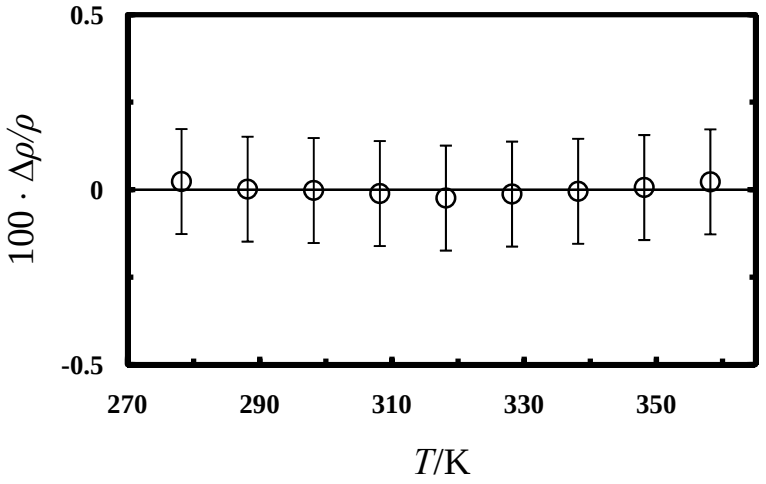

Figure S49.1 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid 1-butyl-3-methylimidazolium acetate as a function of temperature T. The combined (k = 2) expanded uncertainty of the measurements is 0.3 %. The standard deviation of the fit to its data is $100\cdot\sigma(\rho)/\langle\rho\rangle = \pm 0.8\cdot10^{-2}$.

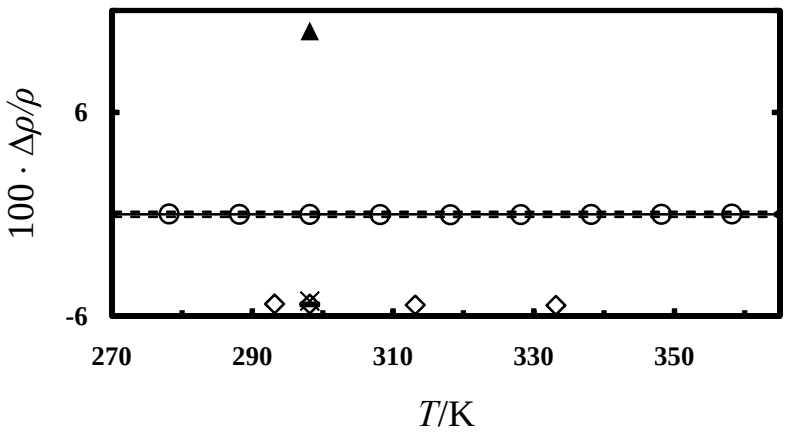

Figure S49.2 Relative deviations $\Delta\rho/\rho = (\rho-\rho_{eval})/\rho$ of the experimentally determined densities ρ of the ionic liquid 1-butyl-3-methylimidazolium acetate as a function of temperature T. The dashed lines at $100\cdot\Delta\rho/\rho = \pm 0.15$ represent the expanded uncertainty of the measurements. o this work; ▲ McHale et al; ◊ Tariq et al.; × Bogolitsyn et al.; ▬ Shiflett et al.

Table S50 Viscosities η of the ionic liquid 1-butyl-3-methylimidazolium acetate at elevated temperatures *T*

Compound	1-Butyl-3-methylimidazolium acetate
CASRN	284049-75-8
Purity	single phase
Physical property	viscosity
Combined expanded (*k* = 2) relative uncertainty	3.0 %
Instrument	Brookfield DV-II+Pro viscometer (model LVDV-11), CPE-40 cone spindle
Standards for calibration	reference oils (Canon S20, S60 and Paragon N10, N100, N1000)
Temperature range of calibration	(278.15 to 333.15) K
Thermocouples used	integrated RTD thermocouple
Calibration of thermocouples	n.a.
Uncertainty of temperature *T*	$\pm$ 1 K
Water mass fraction *w* of sample before measurement	$36 \cdot 10^{-4}$
Water mass fraction *w* of sample after measurement	$90 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	a) McHale et al. *Anal. Chem.* 2008, *80*, 5806-5811. b) Bogolitsyn et al. *Russ. J. Gen. Chem.* 2009, *79*, 125-128.
Comments on literature data	a) Water content after measurement not specified, atmosphere not specified, Brookfield DV-II+ viscometer. b) Water content after measurement not specified, Ubellohde viscometer (capillary diameter 2.1 mm).
Fit function for comparison with literature	$\ln(\eta_{eval}/\eta^0) = \sum_{i=0}^{3} A_i (K/T)^i \quad$ where $\quad \eta^0 = 1\ \mathrm{Pa{\cdot}s^{-1}}$
Standard deviation of fit function	$1.8 \cdot 10^{-3}$

T	η	η_{eval}	$(\eta - \eta_{eval})$	A_0	A_1	A_2	A_3
K	**mPa·s^{-1}**	**mPa·s^{-1}**	**$\eta \cdot 10^{-2}$**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**	**Pa·s^{-1}**
298.15	470	471	-0.1	-21.0	96.2	-115.8	53.6
308.15	216	215	0.4	-21.0	93.1	-108.4	48.6
318.15	111	112	-0.2	-21.0	90.2	-101.7	44.1
328.15	63.8	63.9	-0.2	-21.0	87.4	-95.6	40.2
338.15	39.5	39.6	-0.2	-21.0	84.9	-90.0	36.8
348.15	26.2	26.1	0.5	-21.0	82.4	-84.9	33.7
358.15	18.0	18.0	-0.2	-21.0	80.1	-80.2	30.9

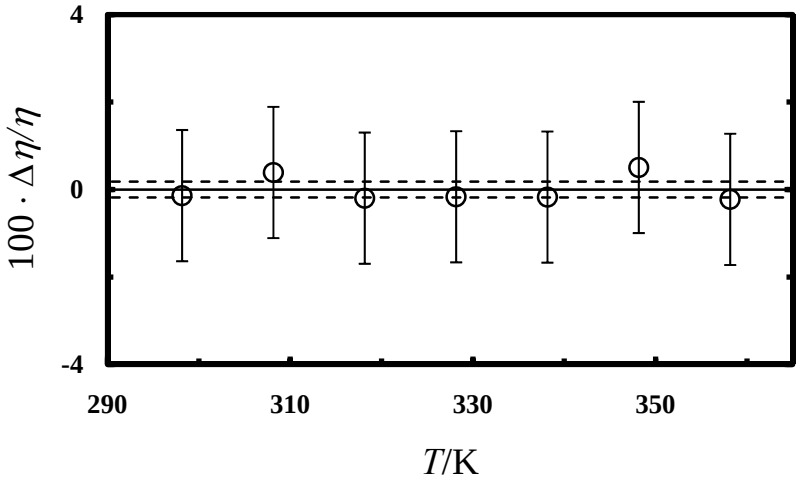

Figure S50.1 Relative deviations $\Delta\eta/\eta = (\eta-\eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid 1-butyl-3-methylimidazolium acetate as a function of temperature *T*. The combined (k = 2) expanded uncertainty of the measurements is 3.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.2$ represent the standard deviation of the fit to its data.

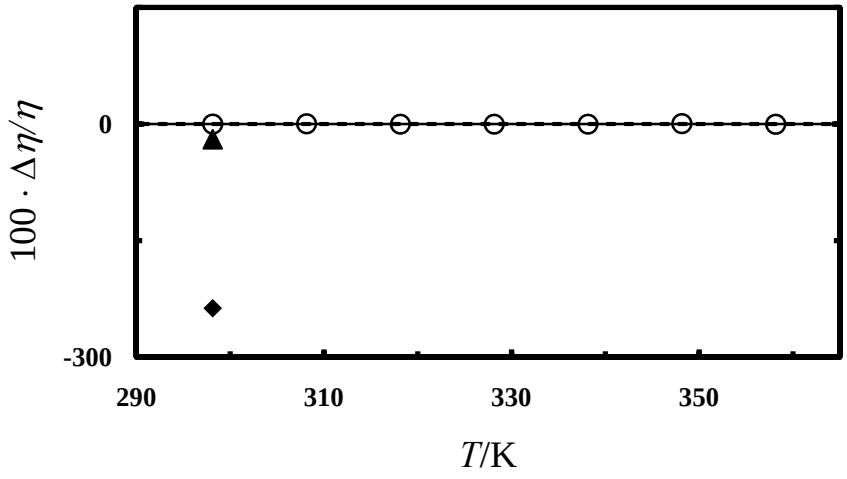

Figure S50.2 Relative deviations $\Delta\eta/\eta = (\eta-\eta_{eval})/\eta$ of the experimentally determined viscosities η of the ionic liquid 1-butyl-3-methylimidazolium acetate as a function of temperature *T*. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 1.5$ represent the expanded uncertainty of the measurements. o this work; ▲ Bogolitsyn et al.; ▲ McHale et al.

Table S51 Conductivities κ of the ionic liquid 1-butyl-3-methylimidazolium acetate at elevated temperatures T

Compound	1-Butyl-3-methylimidazolium acetate
CASRN	284049-75-8
Purity	single phase
Physical property	electrical conductivity
Combined expanded (k = 2) relative uncertainty	2.0 %
Instrument	conductivity flow cell cell (LKB model 5312 A) & Fluke PM 6306 RCL meter at a frequency of 1 kHz
Standards for calibration	IUPAC reference ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide [HMIM]Tf_2N
Temperature range of calibration	(278.15 to 323.15) K
Thermocouples used	standard platinum thermometer of nominal resistance 25 Ω
Calibration of thermocouples	calibrated to ITS-90
Uncertainty of temperature T	$\pm$ 0.01 K
Water mass fraction w of sample before measurement	$36 \cdot 10^{-4}$
Water mass fraction w of sample after measurement	$90 \cdot 10^{-4}$
Atmosphere during measurement	dry N_2
Literature data on property	n.a.
Comments on literature data	n.a.
Fit function for comparison with literature	$\ln(\kappa_{eval}/\kappa^0) = \sum_{i=0}^{3} A_i (K/T)^i$ where $\kappa^0 = 1\ \mathrm{S \cdot m^{-1}}$
Standard deviation of fit function	$5.6 \cdot 10^{-3}$

T	κ	κ_{eval}	$(\kappa - \kappa_{eval})$	A_0	A_1	A_2	A_3
K	S·m^{-1}	S·m^{-1}	$\kappa \cdot 10^{-2}$	S·m^{-1}	S·m^{-1}	S·m^{-1}	S·m^{-1}
278.15	0.008	0.008	0.2	-20.7	74.9	-75.0	16.0
288.15	0.019	0.019	0.0	-20.7	72.3	-69.9	14.4
298.15	0.042	0.042	-0.7	-20.7	69.9	-65.3	13.0
308.15	0.083	0.084	-0.9	-20.7	67.6	-61.1	11.8
318.15	0.154	0.150	2.4	-20.7	65.5	-57.3	10.7
328.15	0.247	0.247	0.1	-20.7	63.5	-53.9	9.7
338.15	0.372	0.377	-1.3	-20.7	61.6	-50.8	8.9
348.15	0.536	0.540	-0.7	-20.7	59.8	-47.9	8.2
358.15	0.736	0.730	0.7	-20.7	58.2	-45.3	7.5

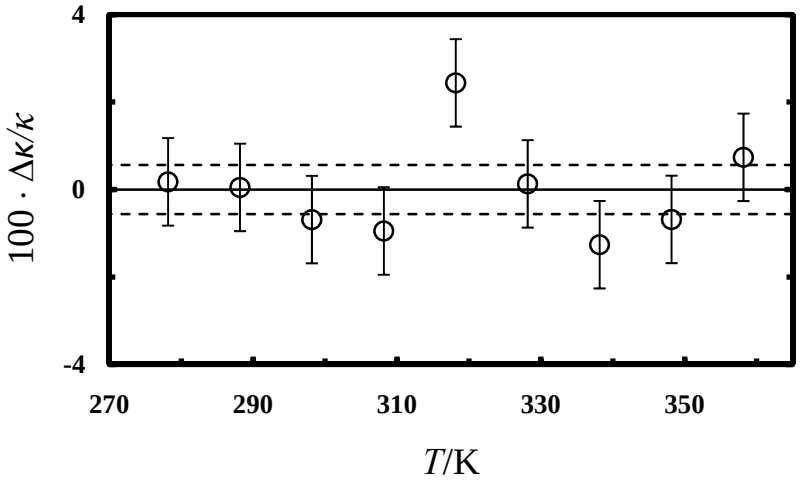

Figure S51.1 Relative deviations $\Delta\kappa/\kappa = (\kappa-\kappa_{eval})/\kappa$ of the experimentally determined electrical conductivities κ of the ionic liquid 1-butyl-3-methylimidazolium acetate as a function of temperature T. The combined ($k = 2$) expanded uncertainty of the measurements is 2.0 %. The dashed lines at $100\cdot\Delta\eta/\eta = \pm 0.6$ represent the standard deviation of the fit to its data.